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Development, Validation, and Testing of a Self-Determination Theory Instrument Called the Motivation to Prepare Healthy Foods Questionnaire

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DEVELOPMENT, VALIDATION, AND TESTING OF A SELF-DETERMINATION
THEORY INSTRUMENT CALLED THE MOTIVATION TO PREPARE HEALTHY FOODS
QUESTIONNAIRE

A Dissertation

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
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in

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by
Ariana DeLong Bailey
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ABBREVIATIONS

BCT	Behavior Change Technique
BMI	Body Mass Index
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
EFA	Exploratory Factor Analysis
EFNEP	Expanded Food and Nutrition Education Program
KMO	Kaiser-Meyer-Olkin
IM	Intrinsic Motivation
NNI	Non-normed Index
PC	Perceived Competence
RMSEA	Root-Mean-Square Error of Approximation
SCT	Social Cognitive Theory
SDT	Self-Determination Theory
SNAP-Ed	Supplemental Nutrition Assistance Program-Education
SRMR	Standardized Root-Mean-Square Residual

ABSTRACT

The objectives of these studies were to validate and confirm the structure of a previously developed questionnaire that measures the psychosocial constructs defined by the Self-Determination Theory (SDT) and then test this questionnaire in a nutrition education setting. The instrument, titled the Motivation to Prepare Healthy Foods Questionnaire (MPHFQ), included items that measured intrinsic motivation, perceived competence, relatedness, autonomy, and autonomy support. These studies evaluated the questionnaire's validity and ability to measure changes in the SDT construct scores.

The MPHFQ is a previously developed and reliable instrument intended to measure adults' intrinsic motivation and perceived competence to prepare healthy foods, their feelings of relatedness toward peers, autonomy, and perceived autonomy support received in a classroom setting. The first study aimed to confirm the five-factor structure provided by the exploratory factor analysis (EFA) of the MPHFQ through confirmatory factor analysis (CFA) and respecification analysis. A total of 507 college students were recruited for the EFA in the first study; 492 responses were analyzed after removing missing data. The EFA provided sufficient support for the hypothesized five-factor model which provided the basis for the CFA and respecification analysis. For these analyses, 520 college students were recruited to complete the MPHFQ; 309 of these responses were randomized to the CFA and the remaining 211 responses were used to complete the respecification analysis. The fit indices provided by the CFA and respecification analysis confirmed the five-factor model. The fit indices for the CFA and respecification analysis, respectively, were as follows: Root Mean Squared Error of Approximation (RMSEA) = 0.56 and 0.055; Comparative Fit Index (CFI) = 0.94 and 0.94; Non-normed Index (NNI) = 0.93 and 0.93; and Standard Root Mean Square Residual (SRMR) = 0.050 and 0.057.

In the second study, the MPHFQ's ability to measure changes in adults' intrinsic motivation and perceived competence as a result of participating in a SNAP-Ed nutrition education and culinary skills-building program was examined. The instrument was administered to SNAP-Ed participants prior to the start of the program and again at the conclusion. A total of 47 SNAP-Ed participants responded to the survey. Perceived competence to prepare healthy foods significantly increased at the completion of the program ($p<0.01$). Intrinsic motivation did not increase for the male participants but was significantly higher for the female participants at the completion of their SNAP-Ed lessons ($p<0.05$). Additional research is needed to further explore these findings and determine if any relationships exist between the SDT constructs and dietary behavior outcomes.

CHAPTER ONE INTRODUCTION

An individual's food preparation knowledge and skills have been found to be associated with positive health and behavioral outcomes.¹ Inadequate cooking skills in adults may increase reliance on convenience foods and meals consumed away-from-home.² Lack of time is also a frequently cited barrier to preparing meals at home.³⁻⁸ As the demands of adulthood increase, the ability to plan and subsequently cook meals at home may suffer.^{8,9} This may lead to greater consumption of fast food meals, which may be related to risk for obesity and poorer diet quality among adults.¹⁰⁻¹² When compared to meals prepared at home, away-from-home meals typically contain more calories, cholesterol, sodium, saturated and total fat, and may provide less fiber, calcium and iron.¹³

Interventions aimed at improving cooking skills and increasing knowledge have been promoted in an attempt to improve adults' health and dietary behaviors.¹⁴⁻¹⁶ The existing literature, however, highlights the need for greater consistency across studies, increased scientific rigor of investigating, and studies based upon well-established and described behavior change theories.^{1,14} Many studies fail to thoroughly explain the framework used to guide the research objectives and also fail to use validated evaluation instruments to determine program effectiveness. Rigorously designed and theoretically-based studies and questionnaires are critical to improving the quality and increasing the reliability of results from culinary-skills building interventions.

Adults typically have an established peer group and experience a balance or imbalance of autonomy and responsibilities.¹⁷ Work habits and the relationships formed with peers during this period may influence behaviors and decisions within an adult's personal life.¹⁸ Targeting adults for health behavior interventions may present unique challenges as they may be more resistant to

change during this life stage. Understanding these potential difficulties is crucial in terms of tailoring programs that can generate meaningful change in this population. Programs to improve health and dietary behaviors in adults may be more effective in promoting behavior change if they are based upon the constructs of established theories such as the Self-Determination Theory (SDT).

The Self-Determination Theory (SDT) is a macro-theory of human motivation that identifies three basic psychological needs: autonomy, competence, and relatedness.^{19,20} The SDT framework focuses on areas relevant to an adult population such as perceived competence, peer relatedness, and autonomous regulation.¹⁹ These facets of adulthood have the potential to influence an individual's intrinsic motivation to adopt and perform tasks or behaviors.^{19,20} Currently, there is no rigorously tested and validated instrument that can assess intrinsic motivation to prepare healthy foods in an adult population.

Justification

Theoretically-based nutrition education programs and validated questionnaires are needed to better examine adults' dietary behaviors and attitudes; however, there are few existing rigorously tested questionnaires and nutrition interventions based on established behavior change theories. Studies that are based on such theories lack consistency in design, differ in choice of theory, and rarely provide thorough descriptions of how the behavior change theory was used to underpin the program or questionnaire. The SDT appears to provide a promising framework to evaluate the status or change in intrinsic motivation to prepare healthy foods; however, no validated instruments are currently available to evaluate healthy food preparation as they pertain to the SDT constructs in an adult population.

Objectives

1. Validate and confirm the structure through confirmatory factor analysis and respecification analysis of a previously developed questionnaire that measures adults' feelings of autonomy, autonomy support, and relatedness within a classroom setting and perceived competence and intrinsic motivation to prepare healthy foods.
2. Evaluate the changes in adults' intrinsic motivation and perceived competence to prepare healthy foods as a result of participating in a SNAP-Ed nutrition education program.
3. Measure the relationships between SNAP-Ed participants' sense of autonomy, autonomy support, perceived competence, and relatedness with their intrinsic motivation to prepare healthy foods.

Purpose

Study 1: Confirm the construct validity of the Motivation to Prepare Healthy Foods

Questionnaire (MPHFQ)

1. The confirmatory factor analysis will provide evidence for an acceptable five-factor model.
2. The respecification analysis will confirm that the five-factor model exists.

Hypothesis

Study 2: Measure the impact of participating in a SNAP-Ed program using the MPHFQ

1. Participants will report increases in intrinsic motivation and perceived competence to prepare healthy foods as a result of participating in the SNAP-Ed program.
2. Intrinsic motivation to prepare healthy foods will be positively associated with perceived competence, relatedness, and autonomy.

Limitations

1. The population samples were convenience samples and therefore the results cannot be generalized to larger populations.
2. The populations examined were predominantly white and female.
3. All responses rely on the honesty of the participants.

CHAPTER TWO

REVIEW OF LITERATURE

Increased consumption of meals away from home and convenience foods is associated with a decline in diet quality.¹⁰⁻¹² Studies have shown that individuals are consuming larger portions of food,²¹ are spending less time preparing meals, are using fewer skills to prepare meals and are incorporating more convenience products into their diets.²²⁻²⁴ Home meal preparation may improve diet quality and reduce weight; however, use of processed convenience products may have negative implications.²⁵ Therefore, encouraging individuals to cook with minimally processed items may be needed and should be investigated further.²⁶

Overweight and obesity

Obesity is a complex disease with many contributing risk factors and associated comorbidities that affects approximately 36.5% of US adults.²⁷ Those affected by obesity are at an increased risk of experiencing heart disease, stroke, type 2 diabetes, and some forms of cancer²⁸; however, the distribution of excess body fat associated with obesity does matter in terms of risk of such comorbidities.²⁹ For instance, visceral fat, or fat deposited centrally on the body, is more greatly associated with cardiovascular disease than subcutaneous fat, or fat distributed in the lower half of the body.²⁹ This distribution of fat along with total percentage of body fat has also been found to predict mortality; greater central adiposity has been associated with higher incidence of myocardial infarction.³⁰

Obesity rates differ across race and ethnicity. The highest rates of obesity are seen in non-Hispanic black adults (48.1%), followed by Hispanic (42.5%), non-Hispanic white (34.5%), and non-Hispanic Asian adults (11.7%).²⁷ No significant differences have been observed between non-Hispanic black and Hispanic men; however, the prevalence of obesity among non-Hispanic black women was significantly higher than among Hispanic women.²⁷

Socioeconomic status and income levels may be associated with the prevalence of obesity. Non-Hispanic black and Mexican-American men reporting higher incomes are more likely to be obese than those with lower incomes, but obesity prevalence is similar among men across all income levels.³¹ Conversely, women with higher incomes are less likely to be obese than lower-income women; however, most obese women are not classified as low income based on poverty levels.³¹ There is also no significant difference in obesity when assessing across education levels among men, but women with lower educational attainment have higher obesity rates.³¹

Understanding the risk factors and environmental influences associated with obesity is important in order to address ways to potentially decrease its prevalence and resulting comorbidities. Maintaining healthy behaviors such as consuming a healthy diet and engaging in regular physical activity may improve long-term health and may prevent diseases such as type 2 diabetes and heart disease.³² An individual's social and community environment can also have an effect on health outcomes. Communities with fewer safe sidewalks or bike trails may prevent families from engaging in healthy behaviors.³² Lack of access to grocery stores and healthier food options can also be significant barriers to achieving a healthy diet.³²

Treatment and prevention of obesity requires adoption and maintenance of healthier lifestyle behaviors.³³ Interventions aimed at promoting healthier behaviors and decreasing obesity rates should consider the multiple factors contributing to overweight and obesity in adults.³³ Use of behavior change theories is one such way interventions can be successful at targeting lifestyle approaches and teaching individuals how to fully incorporate changes to their health behaviors.³³ While it is not known what single behavioral-change model of combination

of models or strategies is best for treating obesity, there is evidence to suggest that behavior change theories are useful at targeting and changing health behaviors.³³

Nutrition education and cooking skills

Consumers with greater cooking experience and skills are less likely to rely on convenience products in home meal preparation.³⁴ Perceived confidence and difficulty and intrinsic motivation/enjoyment to perform a behavior are important factors to consider for engaging individuals in cooking.^{1,35} The importance of enjoyment of a task has been supported³⁵ and may also impact an individual's confidence to engage in a behavior such as cooking.^{1,34,36} These factors are based upon behavior change theories, which are key to providing an evidence-based approach to interventions aimed at promoting and sustaining changes in attitudes and behaviors.²⁶ A theoretical framework does not support many of the existing culinary skills-building interventions, however.^{1,26} The most commonly used theory in the literature appears to be the Social Cognitive Theory, but few details are provided on how it was used to guide the cooking skills intervention.^{1,26} Furthermore, there appears to be a general lack of validated and theoretically based questionnaires to assess the impact of such programs.¹ For researchers to accurately measure and report changes, it is imperative that well-founded and validated instruments be developed.

It is unclear what methods provide optimal learning of culinary skills.²⁶ Michie, et al.³⁷ developed a taxonomy that uses an existing framework that can identify the successful components of multiple types of behavior change interventions. This framework, the 40-item CALO-RE taxonomy of Behavior Change Techniques (BCTs), was created with the purpose of allowing researchers to distinguish and replicate successful elements of such interventions.

A study conducted by Lavelle, et al.²⁶ examined the role of enjoyment and perceived confidence and difficulty as it relates to cooking and investigated different instructional modes for learning to cook using the CALO-RE taxonomy. The participants in this study were randomly assigned to one of four conditions based on common BCTs used in cooking interventions; all subjects completed a cooking and food skills questionnaire prior to involvement. The four conditions to which participants were randomly assigned were as follows: 1) control condition in which the participants received only a recipe card; 2) the participants received a recipe card along with a single-played video demonstration of the recipe; 3) participants were given a recipe card and followed along step-by-step with prompting from a video; 4) participants received a recipe card with a video demonstration that they could stop and re-watch as many times as needed. No significant difference was found between the four conditions, but a significant time effect was seen for confidence, perceived difficulty, and intention to cook again using basic ingredients. Confidence and enjoyment had a positive association with intention to cook again from basic ingredients in the cooking experiment condition, and confidence was positively associated with enjoyment. Perceived difficulty was negatively correlated with intention to cook again, confidence, and enjoyment. The results of this study suggest experience cooking a dish leads to increased intention to cook the meal again.²⁶ Experience may also be related to perceived confidence and enjoyment of cooking. The significant relationships found with confidence and enjoyment indicate that theories such as the Self-Determination Theory may have the potential to provide positive outcomes when used as the guiding frameworks for culinary skills-building interventions.²⁶

These important elements to successful cooking interventions have been supported by other studies. Practical cooking experience has been reported to increase self-efficacy to cook³⁹

and to increase confidence to cook.³⁸ Experience cooking meals appears to be an important factor for increasing confidence and may be a critical component of interventions and programs with the purpose of encouraging home meal preparation.²⁶

The enjoyment of cooking is an often overlooked element of culinary-skills building interventions.⁴⁰ Practical experience may increase the satisfaction of cooking, and has been reported as the most significant predictor of intention to cook again.³⁴ Interventions may be more successful if there is an increased focus on having fun while cooking.^{26,34} Engaging adolescents and younger adults in cooking may also increase the likelihood of enjoyment of meal preparation as they age.³⁴

Many external barriers and factors may affect an individual's capacity to prepare meals at home.²⁻⁸ Family preferences, time constraints and commitments, previous negative experiences cooking, and financial burdens may all impact engagement in home meal preparation.²⁻⁸ To overcome such barriers, researchers should consider different methods to incorporate into their programs and interventions. Calculating a monthly food budget and highlighting fast and easy to prepare recipes may facilitate greater success in behavior change and sustainment.²⁶

Achieving an improved diet quality, especially in lower-income and disadvantaged households, is a public health concern and challenge.^{41,42} Food choices are influenced by an array of factors including personal tastes, cultural beliefs and preferences, public policies, and financial concerns.³⁸ Lower-income households are at a particular disadvantage and face greater restrictions attempting to attain a healthy diet.^{41,42} This population has more limited access to healthy and affordable foods and is often restricted by a lack of cooking skills as well as utensils and appliances.³⁸ Those in lower-income communities are also less likely to have the support and

infrastructure to help influence positive behavior changes.⁴³ The promotion of community ownership is thought to be a vital component of interventions aimed at these populations.⁴³

A study conducted in Scotland, UK used food and shopping diaries and questionnaires to evaluate a standardized seven-week food skills intervention.³⁸ The assessments were delivered at baseline, two-months post-intervention, and at a six-month follow-up to the subjects participating in the intervention and to a comparison group who received the intervention after the assessments had been collected. This intervention sought to increase cooking confidence and food preparation, and promote increased consumption of fiber, fish, vegetables and fruit, and decreased consumption of fat. The researchers also conducted a focus group interview post-intervention to assess dietary intake, food preparation, and cooking confidence. Better perceived cooking skills were associated with a small change in dietary habits (e.g. increased fruit and vegetable consumption at two-month post-intervention). This change was not maintained after the encouragement to cook and eat healthier foods was removed, however. In the qualitative interview, participants reported greater enthusiasm and “adventurousness” for trying new foods after participating in the program. The participants also reported cooking more often from basic ingredients and eating fewer convenience foods; however, the quantitative results found no change in the number of subjects using convenience products. Additionally, confidence in cooking ability was reported to have increased in the intervention subjects but not in the comparison subjects. These small changes could be due to an inadequate number of sessions provided, but could also be the result of the population’s limited resources and persistent restrictions to access and availability of healthier food options.³⁸ Without a substantial change in the community and the environment, it may not be reasonable to expect skills and behavioral maintenance months after participating in an intervention. While the changes in dietary habits

reported as a result of participating in this program were small, it suggests that developing food skills interventions may be beneficial for lower-income populations.

Young adults may lack the knowledge, skills, and competence necessary for meal planning and food preparation.⁴⁴⁻⁴⁶ Access to nutrition education and resources for young adult university students have been national health objectives of the *Healthy Campus 2010*⁴⁷ and *2020*⁴⁸ reports. More specifically, these objectives emphasize increasing the proportion of students who report receiving nutrition education and report consuming five or more servings of fruits and vegetables per day.⁴⁸ Interventions aimed at increasing the competence and skills needed to prepare balanced meals may be one way to approach meeting these objectives. One study based upon the Social Cognitive Theory aimed to increase nutrition knowledge through an educational television program targeted towards a wider college student audience.⁴⁹ The Social Cognitive Theory is a behavior-change theory that emphasizes constructs such as self-efficacy and outcome expectations and describes the interactions between individuals, their behaviors, and their environment.⁵⁰ A total of 114 students were recruited to participate in this study and then randomly assigned to either an intervention or control group. The intervention group watched four 15-minute programs regarding cooking and nutrition over a span of four weeks; the control group viewed four 5-minute programs on sleep disorders. Both groups completed a food frequency questionnaire and a personal factors survey at baseline, post-intervention, and again at a four-month follow-up. These questionnaires were only tested for reliability via test-retest in a sample of non-nutrition students. There was a significant improvement in knowledge in the intervention group at both post-intervention and follow-up. The intervention group also experienced a significant change in cooking motivators, barriers, and self-efficacy at post-intervention, but not at follow-up. Over half (55%) of those receiving the intervention reported a

change in eating habits including increased consumption of fruits and vegetables. The food frequency questionnaire results, however, did not indicate any significant changes in fruit/vegetable intake or cooking patterns.⁴⁹ The changes in nutrition knowledge did not ultimately translate to changes in attitudes and behaviors. Perhaps the study would have been more successful had it incorporated hands-on learning of cooking skills in addition to the nutrition education programming. Other studies that focus on in-person, hands-on culinary skills-building interventions tend to report changes in attitudes toward meal preparation in addition to increased cooking habits.^{34,38,39,51}

Individuals are consuming fewer home-prepared meals and shifting towards an increased reliance on convenience foods when compared to previous decades.^{11,40,52} Cooking skills education has also been declining through the loss of home economics courses and due to parents lacking the skills and knowledge to teach their children how to cook.^{15,40,53} Those who cook more frequently and have more cooking knowledge are more likely to choose healthier alternatives when eating meals away from the home.^{40,54} Adults with greater cooking skills have also been reported to cook more frequently,^{1,14,34} and have increased knowledge, preferences, and self-efficacy with regards to cooking.^{1,14,38,39}

A cooking-skills intervention, based on the Social Learning Theory, randomly assigned 65 college students with a mean age of 19.7 years to either a one-hour cooking demonstration group or an intervention group in which participants attended four, two-hour cooking classes and a supermarket tour that took place over the course of four weeks..⁵¹ The Social Learning Theory is the earlier model of the Social Cognitive Theory; the Social Cognitive Theory highlights the dynamic interaction, called reciprocal determinism, between people, their behaviors, and their environment.⁵⁰ The participants completed an eating habits survey, a cooking survey, and a food

preparation survey before participating in the intervention, at the conclusion of the intervention, and three-months post-intervention. At the three-month post-intervention test, the intervention group was found to have more positive attitudes toward cooking including liking to cook, understanding the benefits of cooking, and confidence in cooking skills.⁵¹ Both groups reported greater confidence to cook at the end of the four-week study. This study was limited by a small sample size and lack of a true control group.⁵¹ Future studies should strive to establish control groups in this population to identify any potential shifts in cooking abilities or behaviors that may occur naturally at this age.

Comparing culinary skills-building studies is difficult for many reasons. Programs are delivered at varying lengths and durations, participants are assessed inconsistently across studies, and inconsistent and often competing definitions pervade.^{1,14} Individuals and researchers do not always share the same ideas and definitions of what constitutes a convenience food product or a meal eaten away from home. Agreed upon and established definitions are necessary to develop more rigorous and consistent studies in the future.¹⁴ More studies with control groups and larger sample sizes are needed to make more generalized conclusions. Additionally, validated and theoretically-based instruments are needed to assess nutrition interventions and provide trustworthy results.¹⁴

Definitions and perceptions of terms such as cooking, homemade, and convenience items vary and are interpreted differently among individuals.⁵⁵ This presents a limitation to studies examining cooking skills and behaviors. A better understanding of how these terms should be defined is important because home food preparation has been associated with healthier diet quality.⁵³ Americans, however, are now cooking less frequently and spending less time cooking than in the past.^{53,57} Many factors are thought to influence frequency and duration of home

cooking. Full-time employment status,⁵⁸ age, and being an ethnic minority⁵⁹ are associated with decreased frequency, while lower income households have been found to spend more time cooking.⁶⁰

A study by Wolfson et al. (2016)⁶¹ examined cooking perceptions and practices among adults using seven focus groups with a total of 53 adults in Baltimore, Maryland. Participants were recruited from one neighborhood with higher median income and greater access to healthy food and from a separate neighborhood with lower income and low access to healthy foods. Three themes emerged from the focus groups. First, the perception of cooking, varied widely irrespective of the neighborhood. Some participants believed cooking required heat application, while others emphasized the value of foods prepared from “scratch.” The second theme was “cooking in the context of modern life.” A majority of adults from both sampled neighborhoods believed cooking at home was less expensive than eating away from home. They also perceived it as a healthier and more sanitary option than eating at a restaurant; however, many participants shared that cooking healthy foods at home was challenging due to time and cost constraints. The final theme was “strategies among frequent cooks.” Common strategies emerged from the focus participants including planning and organizational skills that allowed them to cook more frequently at home. Participants who shared that they utilized these skills also described being more motivated to cook and prioritizing home cooking for themselves or their families. Based on this study, it appears that people from different socioeconomic demographics have varying ideas of what it means to cook and prepare foods at home. Those who were of lower socioeconomic status typically reported that use of convenience items fell under their idea of cooking; those in higher socioeconomic statuses felt that items needed to be made from scratch for someone to have truly cooked. More research is needed to further explore differences in cooking perceptions

among other and more diverse populations. Interventions should then be tailored based on these populations' perceptions and ideas of what constitutes cooking.

Nutrition education in low-income populations

Those who experience food insecurity frequently rely on government-funded programs to procure enough food for their households. Food insecurity is defined as “the availability of nutritionally adequate and safe foods or the ability to acquire acceptable foods in socially acceptable ways is limited or uncertain.”⁶² Such programs that are aimed towards combatting food insecurity in the United States include the Supplemental Nutrition Assistance Program (SNAP), formerly known as the Food Stamps program. Adults who are eligible to receive SNAP benefits may also participate in the educational component of SNAP in order to receive their full benefits. These educational programs typically include hands-on cooking demonstrations in an effort to teach participants how to maximize their resources and budget while also preparing healthy and nutritious meals for their families. The goal is to better equip these individuals with the cooking skills and nutrition knowledge to improve their overall diet quality.

Food insecurity is most common in low-income families, racial and ethnic minorities, and households with children; approximately 12% (15.3 million) of U.S. households were identified as food insecure in 2016.⁶³ Food insecurity has also been associated with lower diet quality, decreased fruit and vegetable intake^{64,65} as well as an increased incidence of overweight, especially among low-income women.⁶⁶⁻⁷² The decline in nutritional value of food-insecure individuals' diets may be related to greater risk of overweight and chronic diseases in lower socioeconomic demographics.⁷³ It is therefore necessary to further investigate which dietary behaviors stem from food insecurity and related issues in order to potentially improve diet quality and decrease the risk of overweight in this population.^{65,74}

One study⁷⁵ examined the relationship between food insecurity and dietary behaviors in low-income adults who were not already consuming a healthy diet and who enrolled in a nutrition intervention. Two separate validated questionnaires were used to assess fruit and vegetable intake and fat-related behaviors. Food insecurity was measured using one question from the Behavioral Risk Factors Surveillance System. This study found that the intake of fruit with juice included was significantly higher in food-insecure households but that fruit intake without juice did not differ between food-insecure versus food-secure groups. Fat-related eating behaviors such as using fat as flavoring and consuming high-fat meats instead of low-fat alternatives were significantly greater in the food-insecure group. This suggests food-insecure individuals may consume more fat than their food-secure counterparts, contributing to the poorer diet quality seen in this population.⁷⁵

The Supplemental Nutrition Assistance Program (SNAP) is the largest federally funded food assistance program and is designed to alleviate food insecurity and improve dietary intake, but the role SNAP plays in improving dietary intake is unclear.⁷⁶ One study⁷⁷ examined both SNAP participants and SNAP-eligible nonparticipants on their perceptions of SNAP and how to improve its impact via survey. Participants reported that SNAP fulfilled its main purpose of allowing individuals to purchase enough food to reduce food insecurity. Both participants and nonparticipants suggested greater emphasis on nutrition education and incentivizing healthful foods to improve dietary intake. A study⁷⁸ conducted in North Carolina examined associations between food insecurity, SNAP benefits per household member, perceived stress, and body mass index (BMI) among 202 female SNAP participants. Perceived stress and BMI were significantly positively related to food insecurity. Mean BMI was also significantly greater among women who received less than \$150 in benefits per household member when compared to women who

received greater than \$150 in benefits per household member. This suggests that providing more adequate SNAP benefits may attenuate the effects of food insecurity on BMI.⁷⁸ Sufficient financial resources can support individuals in making healthier dietary choices and potentially diminish the risk of obesity that has been associated with female SNAP participants.⁷⁹ These results warrant further investigation to explore whether implementing these changes along with increasing the emphasis on learning adequate cooking skills into SNAP-Ed has any impact on participants' diet quality.

Another study⁸⁰ assessed whether participation in certain SNAP-Ed lessons affected participants' intention to improve nutrition-related behaviors such as cooking at home and increased consumption of fruits and vegetables. This was measured using a retrospective post-then-pre survey design. Participants reported that they sometimes engaged in healthier behaviors before attending their SNAP-Ed lessons. They also reported that the SNAP-Ed lessons had a positive impact on their intent to improve certain nutrition-related behaviors. This study is limited by its evaluation methods and the possibility respondents were confused by the retrospective format of the survey. It is also limited by its attempt to measure intention to change rather than actual behavior change. While this study provides some evidence regarding the positive impacts SNAP-Ed may have on participants, more research is needed to examine actual behavior change and if those individuals maintain nutrition-related behaviors as a result of participating in the program.

Few programs, however, have examined the long-term effects of SNAP-Ed and the Expanded Food and Nutrition Education Program (EFNEP) on participants' diet quality and food resource management more than a year after their participation. One long-term evaluation of EFNEP and SNAP-Ed assessed adults who had participated in the Wyoming food assistance

programs at least one year and up to four-years prior using the eighteen-item EFNEP Behavior Checklist.⁸¹ This checklist was also used upon enrollment, graduation, and at one- to four-year follow-up. The curriculum for the programs included food resource management and how to plan menus, food safety as it relates to handling, preparation and storage, and dietary quality as described by the Dietary Guidelines. Food and nutrition behaviors as well as life changes that occurred as a result of participating in the program were assessed via semi-structured interviews. All three scales exhibited a significant positive change from entry to exit and from entry to follow-up but a significant decrease from exit to follow-up. The positive changes were supported through the qualitative interview data. Graduates indicated that they remembered skills learned through the program and continued to apply behaviors learned through the programs' lessons including using a grocery list, comparing prices, menu planning, and cooking at home. Participants also reported increased home meal preparation when food prices increased, including repurposing leftovers and reducing food waste. Other respondents reported increased reliance on canned and frozen fruits and vegetables to save money. This study indicates that the lessons provided through EFNEP and SNAP-Ed have the potential to positively affect participants' dietary habits and quality.⁸¹

More research is needed to examine the eating habits of low-income individuals and to identify strategies to effectively improve diet quality in food-insecure households. Policy interventions such as modifying SNAP requirements to include greater incentives to purchase healthier foods may be beneficial.⁸²⁻⁸⁴ Additional research is also needed to explore the relationships between food insecurity and dietary behaviors.⁷⁵

Self-Determination Theory

Overview

The Self-Determination Theory (SDT) is a macro-theory of human motivation that identifies basic psychological needs and the forces that drive them.^{19,20} The basic psychological needs outlined in the classical SDT approach are autonomy, competence, and relatedness.

Autonomy is the independence or freedom an individual experiences, competence is an individual's ability to do something successfully, and relatedness refers to how connected an individual feels toward others.¹⁹ Autonomy support, or the support an individual perceives he or she has to be independent within their environment, is also described by the SDT as a facilitator of autonomy.²⁰ It is posited that autonomy support plays a vital function in driving autonomy.²⁰ The degree to which these needs are met affects the type and strength of motivation in an individual, and is essential to social development and personal well-being.²⁰ The SDT states that if these basic needs are fully met, an individual will experience intrinsic motivation.²⁰ Intrinsic motivation is the internal drive to explore and master a topic solely for enjoyment, and it appears to have the greatest and strongest potential to drive behavior and behavior change.²⁰

Regulatory Styles

Within the SDT are multiple sub-theories that identify the varying motivational states and evaluate the complex interplays of the basic needs and their external and internal drivers. One sub-theory of the SDT is the Organismic Integration Theory (OIT), which outlines three functionally distinct divisions of motivational states: nonself-determined, partially self-determined, and self-determined.²⁰ The OIT posits a relationship between the degree to which a task or behavior is self-determined and the type of motivation an individual experiences.²⁰ These motivational states are further described by six regulatory styles that exist on a continuum of

human motivation (Figure 1). An individual does not necessarily experience or progress through each construct as a stage; any construct could be experienced fleetingly or skipped altogether.

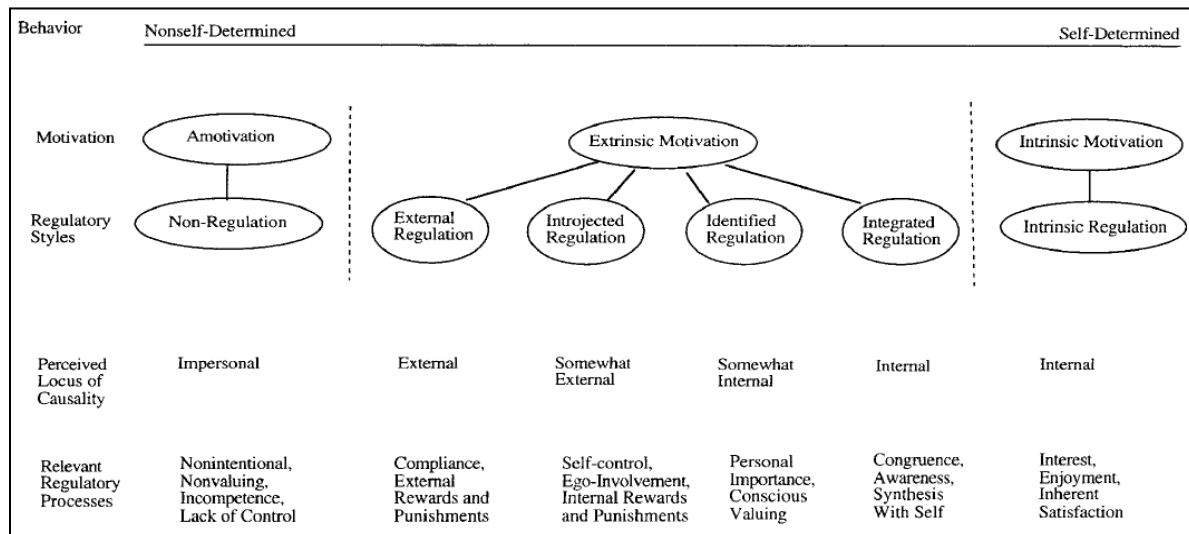


Figure 1. The Self-Determination Continuum Showing Types of Motivation With Their Regulatory Styles, Loci of Causality, and Corresponding Processes. Reprinted from “Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being.” By R. Ryan & E. Deci, 2000, *American Psychologist*, 55(1), 72. Copyright 2000 by the American Psychological Association. Reprinted with permission.

The nonself-determined state is represented by amotivation and its regulatory style of non-regulation. Partially self-determined describes four constructs or regulatory styles as they relate to extrinsic motivation: external regulation, introjected regulation, identified regulation, and integrated regulation. The third motivational state of self-determined is characterized by intrinsic motivation and its regulatory style of intrinsic regulation.

The OIT presents the different motivational states as existing on a continuum.²⁰ At the far left of this continuum is the construct of amotivation. Amotivation is defined as “the state of lacking the intention to act,” and is represented by an impersonal perceived locus of causality and may result from not valuing the task or behavior or not knowing how to perform it.²⁰ At the

far right of the continuum exists intrinsic motivation. Intrinsic motivation occurs when an individual performs a task or behavior because it provides a true and integral enjoyment without external reward. Spanning the two constructs is extrinsic motivation and its regulatory styles. The least autonomous behaviors are classified as externally regulated.²⁰ Externally regulated behaviors are typically performed because of an external reward or demand. The relevant regulatory processes of external regulation are compliance and external rewards and punishments.²⁰

Next on the continuum is introjected regulation, which is contingent on self-esteem and is represented by behaviors performed to avoid guilt or anxiety or to attain ego enhancements such as pride.²⁰ It is further classified by its regulatory processes of self-control, ego-involvement, and internal rewards and punishments.²⁰ A more autonomous and somewhat internalized form of extrinsic motivation is identified regulation. Identified regulation is defined by a conscious valuing of a behavioral goal in which the action is accepted or owned as personally important, with personal importance and conscious valuing of the behavior as its regulators.²⁰ The fourth and most autonomous form of extrinsic motivation is integrated regulation. Its regulatory processes include congruence, awareness, and synthesis with self.²⁰ Integrated regulation occurs when an individual fully integrates and adapts identified regulatory behaviors so that they are perceived and valued equally to other existing interests and behaviors. Despite being autonomous, integrated regulation is distinct from intrinsic motivation. Integrated regulation may be seen as behaviors performed because they are crucial for personal goals or achievement, not because they are inherently interesting.

The SDT in Practice

The continuum of motivation posited by the OIT has been used in a variety of settings including health care,⁸⁵ education,⁸⁶ and physical activity⁸⁷ to predict outcomes such as performance and psychological well-being. While the SDT has been under-utilized in nutrition research, studies have examined the SDT as an approach to eating regulation and other health behaviors. Eating regulation can refer to a range of behaviors and goals including weight management and choosing healthy foods.⁸⁸ In the context of the SDT, eating regulation may not be classified as inherently interesting (i.e. intrinsically motivated). Individuals may not choose to restrict foods or make changes in their dietary patterns for the enjoyment; instead, these changes may be externally motivated by goals such as improving appearance or perhaps out of fear of negative health outcomes.⁸⁸

Ultimately, changes in dietary habits are attempts to achieve some separable outcome, and are extrinsically motivated by definition. However, these extrinsic goals may be internalized in such a way that they become integrated with an individual's sense of self. Changes in eating regulation can be autonomous, internally consistent, and more sustainable for an individual as a result.⁸⁸ More autonomous regulation of eating behaviors is positively associated with individual self-determination and is negatively associated with self-determined behavior when eating regulation is more controlled.⁸⁹ Body dissatisfaction has also been associated with more controlled regulation but not associated with autonomous eating regulation.⁹⁰ The motives and goals driving eating regulation and changes in dietary habits influence how an individual regulates eating behaviors and the likelihood of success or failure in maintaining dietary changes.⁸⁸

The motives behind eating behaviors may also be associated with whether those behaviors are healthy or disordered. Individuals who are more autonomously regulated may engage in healthier eating patterns such as increased consumption of fruits and vegetables and decreased consumption of total and saturated fats.⁹¹ Having greater autonomous motivation may predict more positive attitudes toward food and greater perceived behavioral control over eating behaviors.⁹² It has also been associated with greater adherence to a weight management program and greater weight loss in a sample of obese adults.⁹³ It is important to consider the motivational basis for eating regulation because it is related to the success or failure in regards to weight loss and problematic eating behaviors.⁸⁸ Behaviors that are more autonomous and more intrinsically motivated, as described by the SDT, have been associated with the ability to adapt and maintain healthier eating patterns.

More research is needed to further examine these motivational states and how they relate to successful maintenance and adaptation to changes in dietary habits as they relate to home food preparation. Individuals who more frequently prepare foods at home may also consume healthier foods as a result. The relationship between these two concepts have not been sufficiently explored, however. The existing literature highlights a need for consistent and rigorously designed, theoretically-based, interventions and assessment methods. The SDT provides a relevant and useful framework with which to study these associations. The three basic needs of relatedness, autonomy, and competence outlined by the SDT are key to the understanding of how behaviors such as preparing healthy foods can be successfully regulated and encouraged.

CHAPTER THREE

PSYCHOMETRIC ANALYSES OF THE MOTIVATION TO PREPARE HEALTHY FOODS QUESTIONNAIRE USED WITH YOUNG ADULT COLLEGE STUDENTS

Introduction

National nutritional recommendations are consistently unmet by the majority of Americans.^{94,95} Lack of food preparation knowledge and skills may influence eating habits and the capacity to consume healthful diets.^{44,56,96} Greater confidence in the ability to cook is associated with more home food preparation and higher quality diets.^{51,97,98} Inadequate food preparation skills may lead to increased consumption of fast food and convenience items,^{40,53} which are associated with greater risk for excess weight gain, obesity, and future chronic disease.^{99,100} The impact of participating in culinary skills-building programs on diet quality and weight status has not been established due to a lack of validated evaluation instruments and studies with rigorous designs and adequate sample sizes.^{1,14}

Many young adults may lack the knowledge, experience, and skills to prepare healthy foods;^{44,45} yet, relevant assessment tools capable of measuring adults' motivation and perceived competence to cook are limited. Development of such instruments would allow assessment of status and change in motivation as a result of participation in classroom-based cooking interventions. Recently, this research group developed a questionnaire capable of measuring intrinsic motivation and competence to prepare healthy foods in an adolescent population;¹⁰¹ however, these findings cannot be generalized to other age groups.

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As young adults transition from adolescence, they experience personal growth, develop greater autonomy, and build important support systems with peers that influence their behaviors and decisions.¹⁰² Health behaviors formed in adolescence track into young adulthood and are difficult to change later in life.¹⁰³ Theories such as the Self-Determination Theory (SDT) can be applied to a broad range of disciplines to identify approaches to improve health behaviors.¹⁹ The SDT is a macrotheory of human motivation that identifies and addresses basic psychological needs for autonomy, autonomy support, competence, and relatedness.²⁰ Autonomy refers to the independence an individual experiences; autonomy support refers to an environment that fosters autonomous behavior. Competence is an individual's ability to complete a task successfully, and relatedness refers to how connected an individual is to others.^{19,20} The SDT suggests intrinsic motivation to perform a task is supported, rather than diminished, when these needs are adequately met.²⁰

The purpose of this study was to develop and test a questionnaire, titled the "Motivation to Prepare Healthy Foods Questionnaire (MPHFQ)," which measures the SDT constructs of autonomy, autonomy support, relatedness, perceived competence, and intrinsic motivation to prepare healthy foods in a young adult college student population as it pertains to the classroom setting. The research objectives included establishing face validity, determining if the items related to the hypothesized constructs, confirming the internal structure and verifying that the hypothesized constructs existed, and determining the reliability of young adult college students' scores for the MPHFQ constructs.

Methods

Instrument development

The MPHFAQ consisted of 25 statements that represented the psychosocial constructs of the SDT and was adapted from an instrument previously validated with an adolescent (high school) audience.¹⁰¹ Statements to assess intrinsic motivation, perceived competence, and relatedness were initially adapted by Miketinas, Cater, Bailey, Craft, and Tuuri¹⁶ from the Intrinsic Motivation Inventory.¹⁰⁴ The autonomy support and autonomy statements were originally adapted by Miketinas and colleagues¹⁰¹ from the Learning Climate Questionnaire¹⁰⁵ and Weinstein and colleague's¹⁰⁶ index of autonomous functioning, respectively.

Definitions provided by the SDT and operational definitions were followed to tailor the questionnaire to young adult college students and their attitudes toward food preparation within a classroom setting. The intrinsic motivation statements measured inherent satisfaction with preparing healthy foods. These items were designed to capture an individual engaging in the activity solely for enjoyment and not for externally motivated reasons. The perceived competence items measured individuals' perceptions of their ability to cook in relation to their own skills and in comparison to their peers. The autonomy statements referred to individuals' perceptions of their ability to make personal decisions and to participate within a classroom setting. The autonomy support items assessed the students' feelings regarding their instructor's support of the students' autonomy within the classroom. Finally, the relatedness items examined an individual's feelings of closeness to and trust of his or her classroom peers. The purpose of its use in a classroom is to better understand if a relationship exists between a student's feelings of autonomy, autonomy support, and relatedness in any given classroom and their intrinsic

motivation to prepare healthy foods. The wording of the MPHFAQ statements was based on the Miketinas et al.¹⁰¹ questionnaire prior to the focus group discussions.

To establish face validity of the MPHFAQ, three nutrition educators who had worked with young adult populations provided feedback regarding word choice and comprehension. Two focus group discussions were also conducted with young adult university students (n=10, n=12) to assess comprehension and suitability of the items. Examples of questions asked included: “Are there any statements that are confusing or unclear?” and “Are there any words or statements that you would suggest changing to improve understanding?” Based on feedback regarding understanding and wording of the items from these individuals, intrinsic motivation items 1, 2, 4, and 5, perceived competence item 1, and relatedness item 2 were reworded from the Miketinas et al.¹⁰¹ survey to be more appropriate for a young adult population. For example, the perceived competence statement by Miketinas et al.¹⁰¹ was, “I think I am pretty good at preparing healthy food.” The altered MPHFAQ statement was, “I believe I am talented at preparing healthy food.”

The final MPHFAQ included the following number of statements representing the SDT constructs: five for intrinsic motivation, five for perceived competence, six for perceived autonomy support, five for relatedness, and four for autonomy. As the MPHFAQ was developed prior to the release of the 2015-2020 Dietary Guidelines, the following statement was included in the questionnaire to reflect the 2010 Dietary Guidelines for Americans recommendations¹⁰⁷ and foods typically under-consumed (such as fruits, vegetables, and dairy products) by the American population: “Fruits, vegetables, low-fat milk and milk products, and whole grains are considered healthy foods while foods high in sodium (salt), solid fats, and added sugars are considered less healthy.”¹⁰⁷ Questions directed participants to indicate the extent to which they agreed or disagreed with the questionnaire items using a 5-point Likert scale. Possible responses and

coding included: 1 for “Disagree a lot,” 2 for “Disagree,” 3 for “Neither agree/disagree,” 4 for “Agree,” and 5 for “Agree a lot.” None of the statements were reverse-coded.

Study 1

A convenience sample of free-living adults 18-30 years of age (n=507) enrolled in classes at a large public university in the southeastern United States volunteered to complete the MPHFAQ.¹⁰⁸ Subjects provided written consent prior to participating with the understanding that they would have a chance to win one of ten \$10 gift cards. The investigators contacted the instructors of general management, nutrition, and mass communication courses to gain permission to enter his or her classroom to ask students to participate. The questionnaire was then administered to the students who volunteered ten minutes prior to instruction time. The investigators administering the MPHFAQ followed a standard protocol and advised the participants not to complete the survey if they were pregnant, older than 30 years of age, or younger than 18 years. Students were also directed to refer to their instructor, classmates, and their own actions in the class when answering the questionnaire statements regarding autonomy support, relatedness, and autonomy, respectively. It is important to note that the autonomy support, relatedness, and autonomy variables are not intended to predict intrinsic motivation and perceived competence to prepare healthy foods; rather, these variables are attempting to capture a student’s feelings related to these constructs irrespective of the course content. The SDT posits that autonomy support, relatedness, and autonomy are facilitators of intrinsic motivation to perform a specific task; thus, the former three constructs can be generalized and not constrained to a specific setting. The pencil-paper questionnaire was administered to students enrolled in university general management (n=299), introductory nutrition (n=146), and mass communication (n=62) courses. To determine the test-retest reliability of the young adults’

scores for the constructs, the MPHFAQ was administered twice to the same students enrolled in a kinesiology course (n=36) and an upper-level nutrition course (n=24). The test-retest was limited to these courses due to course availability and instructor permission. There was a two-week interval between the test and retest administration of the survey. All responses were kept secure and anonymous. These studies were approved by the Louisiana State University Agricultural Center Institutional Review Board.

Demographic information including age, race/ethnicity, and gender was collected along with the survey responses for the analyses. Data were analyzed using exploratory factor analysis (EFA) to identify the latent constructs of the survey responses. Internal consistency reliability was assessed using Cronbach alpha on each of the retained constructs. Responses to the questionnaire were subjected to principal axis factoring with promax rotation.¹⁰⁹ Principal axis factoring was used to minimize effects of nonnormal data. Sample size was estimated using the recommended 20-to-1 ratio of observations to items.¹¹⁰ To ensure adequate item correlation, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was expected to have a value greater than 0.6,¹¹¹ and the Bartlett's test was expected to have a significant p -value (<0.001).¹¹⁰ The factor inclusion criterion was determined by using a minimum value of 1.0 extracted eigenvalues and by determining the number of factors indicated by the scree plot. Individual items were retained if factor loadings on both the pattern and structure matrices were greater than 0.4 and did not have significant multi-collinearity ($r > 0.90$).¹¹¹ If an item loaded highly on more than one factor, it was removed before further analysis. Cronbach alpha values greater than 0.7 were considered acceptable for internal consistency.¹¹² Pearson's r values correlation coefficients were expected to be greater than 0.60 for each of the constructs to have acceptable test-retest reliability. The assumptions of normality and homogeneity of variances for the Pearson's test

were met. Analyses were conducted using SAS[®] software (version 9.4, SAS Institute, Inc, Cary, NC, 2013).

Study 2

The hypothesized five-factor model generated by the EFA was examined to confirm the factor structure of the MPHFAQ. Another convenience sample of 520 free-living college students between 18 and 30 years of age enrolled in university business management (n=375) and nutrition courses (n=145) were recruited to complete the paper-pencil MPHFAQ. The same standard protocol used for the EFA was followed. Students provided written consent prior to completing the questionnaire with the knowledge they could win one of ten \$10 gift cards for their participation.

Participants were randomized into one of two groups to perform both a CFA and a hold-out sample for respecification analysis. Modification indices were provided by the CFA and were used to make an a priori determination about the respecification strategy. The SDT was used to make theoretically meaningful decisions about items to remove or retain. To prevent depriving the CFA of observations, the majority of the dataset was randomly assigned to the CFA (n = 309) while the remainder was randomly assigned to the hold-out sample (n = 211). This resulted in a 12-to-1 and 8-to-1 ratio of response to items, respectively. Demographic information including age, race/ethnicity, and gender was again collected for the analyses.

Influential outliers and leverages were identified by examining residuals using the Mahalanobis distance ($p < 0.01$).¹⁰⁹ Outlier and leverage diagnostics plots were also used to detect influential points.¹⁰⁹ Fit indices were used to evaluate both models.¹¹³ These included: Standardized Root Mean Square Residual (SRMR), Root Mean Square Error of Approximation (RMSEA), Bentler Comparative Fit Index (CFI), and Bentler-Bonett Non-normed Index (NNI).

Cutoff values of 0.08 for SRMR and 0.06 for RMSEA were used to examine model fit.¹¹⁴

Geiser¹¹⁵ recommends a SRMR cutoff of 0.05 for best model fit. The CFI and NNI were used as comparative measures of fit of saturated and unsaturated models; values close to .95 were considered acceptable.¹¹⁴ Analyses were performed using SAS[®] software (version 9.4, SAS Institute, Inc, Cary, NC, 2013).

Results

Study 1

After removing incomplete responses (n=507), 492 individuals comprised the analytic sample. Incomplete responses were found to be missing at random, minimizing the risk of bias in the remaining sample. The participants' mean age was 20.2 ± 1.9 years, and 321 (63%) were female. The young adults' self-reported racial/ethnic representation included 360 (71%) Caucasians, 78 (15%) African Americans, 25 (5%) Hispanic/Latinos, 41 (8%) from other/mixed race, and three participants (1%) who did not provide this information.

The analysis had an acceptable sampling adequacy (KMO=0.89) and significant sphericity (Bartlett's Test $p < 0.001$) suggesting sufficient correlation among items to permit factor analysis. The EFA returned five factors that explained 56.5% of the variance. The scree plot also indicated a five-factor solution. Items were retained if factor loadings on both the factor and structure matrices were greater than 0.4,¹¹¹ and had extracted eigenvalues greater than or equal to 1.0 (intrinsic motivation=7.0; perceived competence=3.2; autonomy support=1.8; relatedness=1.2; autonomy=1.0). Responses for statements representing each of the SDT constructs with loadings are shown in Table 1.

Table 1. Exploratory factor analysis pattern and structure matrices with communalities (h^2)

Items by Factor	Pattern Matrix	h^2	Structure Matrix	Explained Variance
Factor 1: Perceived Competence				28.1%
I believe I am talented at preparing healthy food.	.80	.78	.87	
I do pretty well preparing healthy food compared to other people my age.	.68	.68	.81	
I feel pretty confident about my food preparation skills.	.87	.74	.85	
I am satisfied with my ability to prepare healthy foods.	.90	.75	.86	
I am pretty skilled at preparing healthy food.	.94	.87	.93	
Factor 2: Autonomy Support				12.9%
My instructor provides me with choices and options.	.59	.39	.61	
I feel my instructor understands me.	.79	.55	.74	
My instructor expresses confidence in my ability to do well in the course.	.67	.46	.67	
My instructor encourages me to ask questions.	.47	.36	.57	
My instructor listens to how I would like to do things.	.80	.65	.80	
My instructor considers how I see things before suggesting a new way to do things.	.79	.65	.80	
Factor 3: Intrinsic Motivation				7.0%
I enjoy preparing healthy food.	.80	.72	.84	
I think it is satisfying to prepare healthy food.	.85	.61	.78	
Preparing healthy food holds my attention well.	.79	.72	.84	
I would describe preparing healthy food as very engaging.	.69	.60	.77	
I understand the value of preparing healthy food.	.52	.32	.56	
Factor 4: Relatedness				4.6%
I can trust my classmates.	.45	.25	.48	
I would like a chance to interact with my classmates more often.	.73	.48	.68	
It is likely that my classmates and I could become friends if we interacted a lot.	.70	.53	.72	
I feel close to my classmates.	.52	.31	.54	
I enjoy interacting with my classmates.	.84	.69	.83	
Factor 5: Autonomy				3.7%
If I had the choice, I would choose to take this class.	.40	.28	.50	
I feel comfortable participating in class.	.67	.50	.70	
I feel free to make my own decisions in class.	.71	.51	.70	
I feel free to express myself, my opinions, and my concerns in class.	.82	.64	.80	

Statement mean scores ranged for each factor as follows: Perceived competence=3.1 to 3.5; Autonomy support=3.4 to 4.0; Intrinsic motivation=3.6 to 4.4; Relatedness=2.6 to 3.5; Autonomy=3.6 to 4.0. Each factor had acceptable internal consistency (Table 2).¹¹² Mean factor scores and Cronbach alpha values are shown in Table 2. No extreme multicollinearity was observed among the items. The questionnaire had acceptable test-retest reliability (n=60).¹¹⁶ Test-retest correlations were: Perceived competence=0.79; Autonomy support=0.69; Intrinsic motivation=0.79; Relatedness=0.69; Autonomy=0.66. The correlations among the MPHFAQ factors were also examined (Table 3).

Table 2. Factor Means and Reliability of the Motivation to Prepare Healthy Foods Questionnaire (n=492)^a

Factor/Scale	Number of Items	Reliability ^b	<i>M</i> ^c	SD
1. Perceived Competence	5	0.94	3.3	0.99
2. Autonomy Support	6	0.85	3.7	0.59
3. Intrinsic Motivation	5	0.87	3.9	0.67
4. Relatedness	5	0.78	3.3	0.61
5. Autonomy	4	0.77	3.8	0.62
^a The questionnaire was administered to students enrolled in university general management (n=299), introductory nutrition (n=146), and mass communication (n=62) courses. ^b Cronbach alpha measure of internal consistency and reliability ^c Mean values based on the 5-point Likert-type scale. Response categories are as follows: 1=Disagree a lot, 2=Disagree, 3=Neither Agree/Disagree, 4=Agree, 5=Agree a lot				

Table 3. Correlations among Motivation to Prepare Healthy Foods Questionnaire Factors (n=492)^a

Factor	1	2	3	4	5
1. Perceived Competence	1.00				
2. Autonomy Support	.21***	1.00			
3. Intrinsic Motivation	.62***	.26***	1.00		
4. Relatedness	.29***	.27***	.28***	1.00	
5. Autonomy	.25***	.50***	.23***	.38***	1.00
*** <i>p</i> <.001					
^a The questionnaire was administered to students enrolled in university general management (n=299), introductory nutrition (n=146), and mass communication (n=62) courses					

In agreement with the findings by Weinstein et al.,¹⁰⁶ perceived competence and intrinsic motivation shared a moderately strong correlation (0.62) and autonomy and autonomy support shared a moderate relationship (0.50). The remaining factors displayed weak correlations.

Study 2

The majority of the 309 participants in the CFA were female (56%) and the group had a mean age of 20.9 ± 1.7 years. Of those individuals, 228 (75%) were Caucasian, 34 (11%) were African American, three (3%) were Hispanic/Latino, six (10%) indicated other/mixed race, and one did not indicate race/ethnicity. To account for missing data, full information maximum likelihood method was used. No univariate outliers were identified; numerous (exceeding 25) multivariate outliers were detected. The software most likely tried to overfit the data,¹¹⁷ resulting in such a high number of outliers. Robust maximum likelihood estimation was thus used in the CFA to diminish the effect of problematic outliers. This method eliminates the need to remove outliers and provides unbiased parameter estimates for the model; however, outliers that also acted as leverages were removed to prevent extreme influential data points. Three observations were returned as both outlier and influential leverage points and were removed for further analysis. Missing data were found to be missing at random. The final CFA model included 306 observations.

In the respecification group ($n=211$), 55% were female and the mean age was 20.8 ± 1.7 years. The participants included 164 (77%) Caucasians, 21 (10%) African American, six (3%) Hispanic/Latino, and 21 (10%) indicated mixed/other. All three samples for the EFA, CFA, and respecification analysis were similar in terms of demographics. No univariate outliers were found, but more than 25 multivariate outliers were identified. Robust maximum likelihood

estimation was used again to minimize any effects produced by these outliers. One response that was a multivariate outlier and influential leverage point was removed.

The CFA and respecification analysis provided support for adequate fit of the five-factor model hypothesized by the EFA. For both analyses, a significant chi-square value was returned, and the RMSEA values and confidence intervals suggested the model fit the data (Table 4). The SRMR values were below 0.08, but not less than 0.05. The CFI and NNI values were slightly lower than the suggested 0.95 cutoff.¹¹⁴

Table 4. Goodness-of-Fit measures of the Motivation to Prepare Healthy Foods Questionnaire Models

Model	X ²	df	RMSEA ^b	^c CFI	^c NNI	^d SRMR
Five-Factor CFA (n=306) ^a	514.79***	265	.056 [.049, .063]	.94	.93	.050
Five-Factor Validation (n=211) ^a	429.87***	265	.055 [.045, .064]	.94	.93	.057
^a The questionnaire was administered to students enrolled in university business management (n=375) and nutrition courses (n=145). ^b RMSEA: Root Mean Square Error of Approximation; cutoff: 0.06 ^c CFI: Comparative Fit Index; NNI: Non-normed Index; values close to 0.95 acceptable ^d SRMR: Standard Root Mean Square Residual; cutoff: 0.5 ***p<.0001						

Figures 2 and 3 illustrate the standardized parameter estimates and error terms for the CFA and respecification analysis, respectively. The two figures reflect that the variance was fixed at one for each factor. Significance for the parameter estimates and covariances between factors were determined by t-values of 2.06 ($\alpha=0.05$) and 2.79 ($\alpha=0.01$) with 24 degrees of freedom.

Discussion

Results suggested that the MPHFQ statements represent the five SDT constructs and provide preliminary evidence for the validity of the questionnaire for use with a young adult college population. A review of the literature indicated a lack of available instruments based on

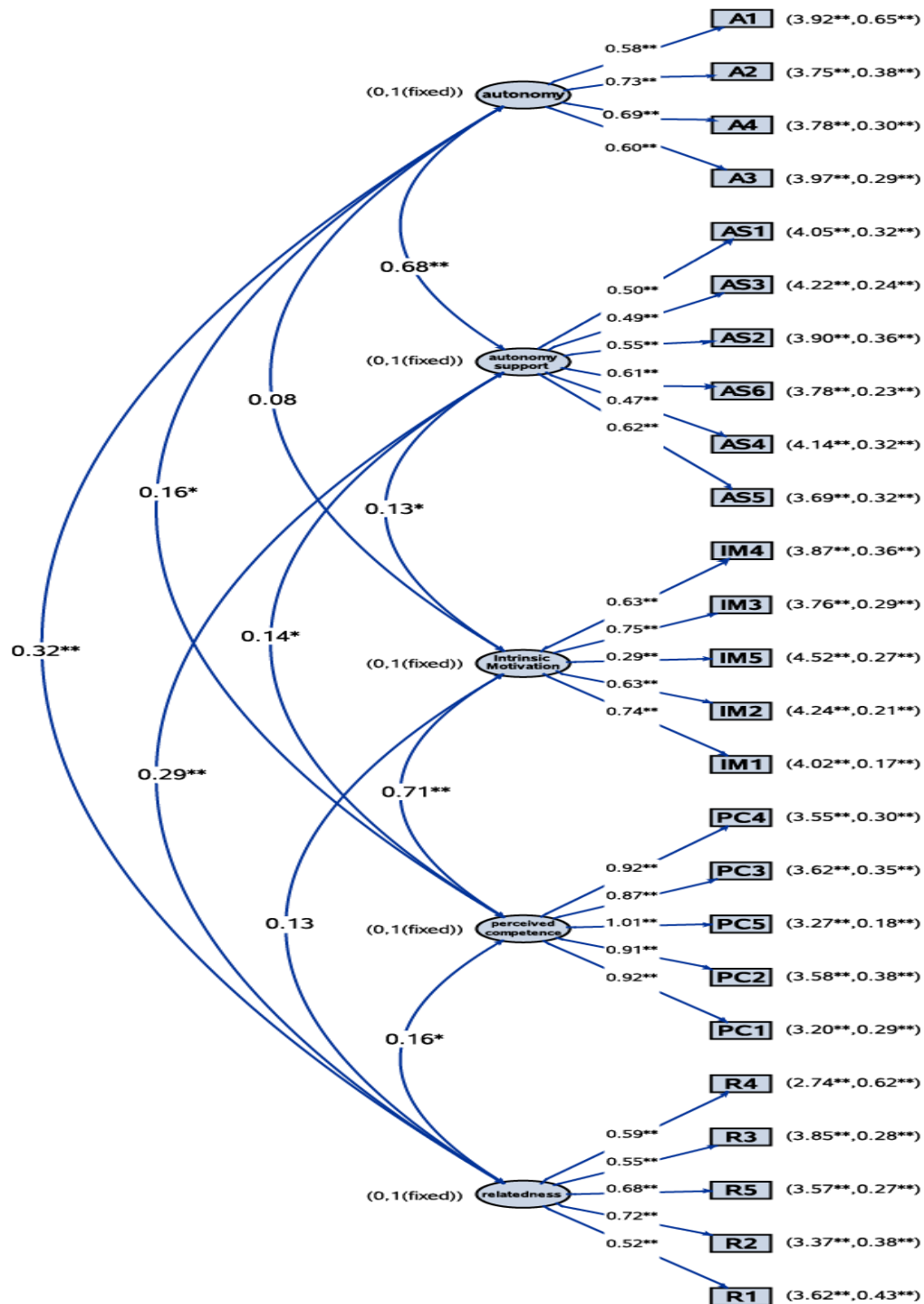


Figure 2. Confirmatory factor analysis of the five-factor Motivation to Prepare Healthy Foods Questionnaire (n=306). Parameter estimates and standard errors are listed respectively in parentheses for each path. *Note:* A = autonomy, AS = autonomy support, IM = intrinsic motivation, PC = perceived competence, and R = relatedness. * $\alpha=0.05$, ** $\alpha=0.01$

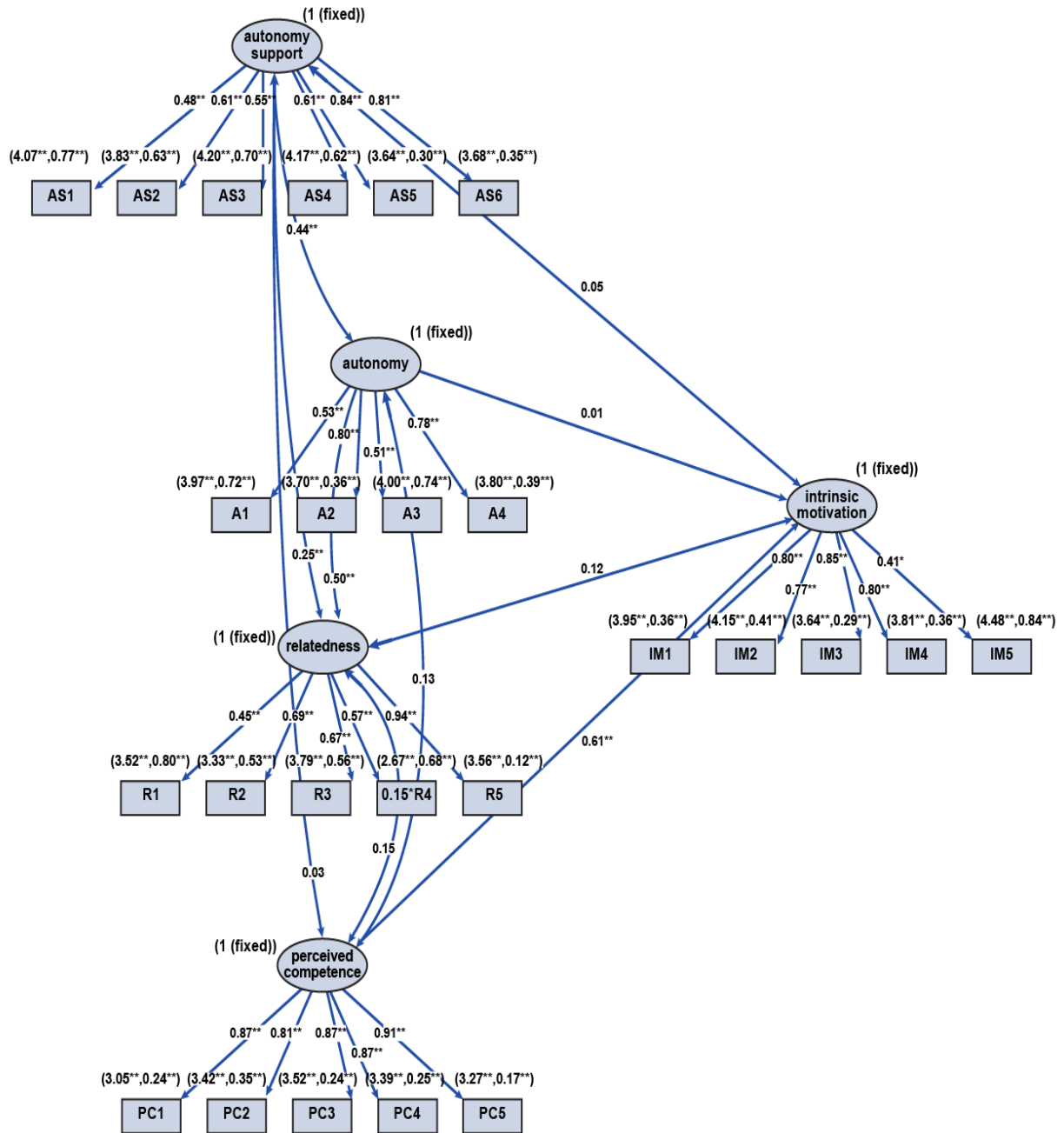


Figure 3. Respecification analysis of the five-factor Motivation to Prepare Healthy Foods Questionnaire (n=210). Parameter estimates and standard errors are listed respectively in parentheses for each path. Note: AS = autonomy support, A = autonomy, IM = intrinsic motivation, R = relatedness, PC = perceived competence. * $\alpha=0.05$, ** $\alpha=0.01$

established theories that could estimate changes in attitudes toward cooking in adults. The SDT is an appropriate theory to help understand possible engagement in healthier dietary behaviors,¹⁴ and because of its focus on autonomy,^{19,20} it appears to be particularly appropriate for use with a young adult college student audience. The MPHFAQ is unique as it appears to capture SDT constructs relevant to the young adult college student population and assess an individual's intrinsic motivation to prepare healthy foods.

More research is needed in the realm of culinary skills-building programs due to inconsistent measurements of existing programs and lack of rigorous study designs and validated instruments.^{1,14} Skill development, greater knowledge of food and nutrition, and confidence in cooking have been the primary focuses of existing interventions,¹ but other attitudes and behaviors in relation to theoretical frameworks should also be considered.¹⁴ The SDT presents a framework that addresses potential barriers and facilitators to diet quality. Relatedness, autonomy, and autonomy support are considered crucial to an individual's sense of belonging within their environment; facilitating these constructs could foster the competence and intrinsic motivation needed to cook.

While the SDT has not been extensively used as the foundation for nutrition intervention programs or in the development of questionnaires to detect changes in motivation to prepare healthy foods, it offers a promising framework to help young adults improve their health-related behaviors.^{118,119} An instrument such as the MPHFAQ could aid nutrition researchers in identifying low autonomy, autonomy support, and relatedness within a classroom-based culinary skills-building program and how those relate to the participants' motivation and perceived competence. Fostering a more autonomy-supportive environment would allow an individual to be more

autonomously motivated and consequently experience increased intrinsic motivation to perform a task.²⁰

This study has strengths and limitations. Strengths of this study include the adequate sample sizes¹²⁰ and acceptable internal structure, internal consistency, and test-retest reliability of the instrument. This study was limited by the use of convenience sample of young adults enrolled in a public university in the southeastern United States. Most participants were white and female; and therefore results are not generalizable to more diverse populations or to populations with lower educational attainment. Findings are limited by the truthfulness of subject responses.

Implications for research and practice

Development of valid and reliable evaluation instruments is critical for providing meaningful and interpretable results in regards to nutrition interventions. Further research is needed to establish convergent and discriminant validity of the MPHFAQ. Differential item functioning analysis may also be of interest to assess the response to items across age groups; validating the MPHFAQ in middle-aged and older adults in future research could allow its use in a wider adult population. The MPHFAQ should also be tested among a more diverse sample.

Based on these results, the MPHFAQ has the potential to be used in classroom-based nutrition culinary skills-building programs targeting motivation to prepare healthy foods in college students. Young adulthood is a seminal time for habit development and health-related behaviors.^{103,121} Targeting this population may be of interest in future research to promote and encourage behaviors and attitudes that may improve health outcomes. An instrument such as the MPHFAQ will support culinary skills-building research by allowing investigators to evaluate

program impact on participants' intrinsic motivation and perceived competence to prepare healthy foods.

CHAPTER FOUR

ASSESSING CHANGE IN MOTIVATION TO COOK USING THE MOTIVATION TO PREPARE HEALTHY FOODS QUESTIONNAIRE IN A SNAP-ED POPULATION

Introduction

The Supplemental Nutrition Assistance Program-Education (SNAP-Ed) is the largest federal food assistance program in the United States.¹²² In 2016, approximately \$66.5 billion was spent for SNAP-Ed across the 44.2 million Americans who received SNAP benefits, with roughly \$1.5 billion of that being spent across 927,000 individuals in the state of Louisiana.¹²³ The primary goal of SNAP-Ed is to improve dietary intake and diet quality among SNAP participants and other low-income individuals who have greater access to food via SNAP benefits.¹²² Participants in SNAP-Ed are encouraged to embrace healthier eating habits through the SNAP-Ed educational component, which often includes hands-on cooking demonstrations, delivered via trained agents.¹²⁴ Evaluation of these programs is therefore critical in order to demonstrate positive outcomes associated with participating in SNAP-Ed.

Improved diet quality is associated with increased frequency of home food preparation, higher confidence in cooking abilities,⁶⁻⁸ and greater food preparation knowledge and skills.³⁻⁵ Individuals who lack food preparation skills may be more likely to consume fast food and convenience items,^{9,10} which have been linked to an increased risk for weight gain, obesity, and future chronic disease.^{13,14} The educational component of SNAP has a unique opportunity to increase individuals' knowledge of cooking skills and ability to prepare healthier foods at home. Participation in SNAP-Ed could also potentially influence an individual's motivation and perceived competence to perform those skills as a result of participating in hands-on cooking demonstrations taught by a SNAP agent. The role SNAP plays in improving dietary intake or an individual's motivation to prepare healthy foods is unclear, however.¹²⁵

Validated and theoretically-based evaluation methods are essential to reliably assess program effectiveness. This research group previously validated and published an instrument based on the Self-Determination Theory (SDT) titled the Motivation to Prepare Healthy Foods Questionnaire (MPHFQ). The SDT is a macrotheory of human motivation that addresses five psychological constructs: autonomy, autonomy support, competence, relatedness, and intrinsic motivation.^{19,20} Autonomy refers to an individual's sense of personal independence and freedom to effectively perform a behavior whereas autonomy support relates to an environment that fosters autonomous behavior.¹⁹ Competence is defined as an individual's ability to perform a task successfully, and relatedness is distinguished by how connected an individual feels towards others.^{19,20} The SDT posits that when these four needs are sufficiently met, an individual will experience intrinsic motivation.²⁰ This form of motivation is characterized by an individual's capacity to perform a task because of an inherent enjoyment (i.e. a task is not performed for any external gain), and is considered the purest form of motivation.²⁰

Due to the fundamental structure of SNAP-Ed, the SDT appears to be a relevant model to assess program effectiveness. Those who are enrolled in the Louisiana SNAP-Ed "Let's Eat for the Health of It" curriculum are typically expected to complete a series of agent-guided lessons alongside other individuals who are eligible for SNAP benefits. Some of the lessons included in this curriculum also include various demonstrations regarding proper food safety skills and food preparation skills using materials and ingredients available to them with their SNAP benefits.

The purpose of this secondary analysis was to assess SNAP-Ed participants' intrinsic motivation and perceived competence to prepare healthy foods, autonomy, autonomy support, and relatedness using the validated MPHFQ. Relationships between the SNAP-Ed participants'

sense of autonomy, autonomy support, perceived competence, and relatedness with their intrinsic motivation was also explored.

Methods

Participants

Adults enrolled in SNAP-Ed were recruited to complete the MPHFAQ on a tablet provided to them in class by a SNAP-Ed agent prior to beginning and at completion of his or her respective participation in the “Let’s Eat for the Health of It” program. Recruitment for the study began in the fall of 2017 and finished in May of 2018. The SNAP-Ed participants provided consent by checking a box online that asked if they were willing to complete the MPHFAQ prior to taking the questionnaire. All of the participants’ information was de-identified before performing the secondary analyses. Responses were kept anonymous and secure. The study was approved by the Louisiana State University Agricultural Center Institutional Review Board.

Survey Instrument

The MPHFAQ is a validated and reliable questionnaire, which measures an individual’s intrinsic motivation and perceived competence to prepare healthy foods, sense of autonomy, perceived autonomy support from an instructor, and feelings of relatedness toward peers. For the SNAP-Ed participants completing the MPHFAQ in this study, the perceived autonomy support from an instructor referred to the SNAP-Ed agent delivering the “Let’s Eat for the Health of It” curriculum, and relatedness toward peers referred to fellow classmates/SNAP-Ed participants. Participants were asked to respond to the 25-item questionnaire using a five-point Likert-type scale with response categories of “disagree a lot,” “disagree,” “neither agree/disagree,” “agree,” and “agree a lot.” The responses are scored as 1, 2, 3, 4, and 5, respectively. These responses

were then summated within each of the five factors to give composite factor scores for every participant.

Let's Eat for the Health of It

The guiding curriculum for SNAP-Ed programs in Louisiana is called “Let’s Eat for the Health of It,” and typically spans six to eight weeks with each week focusing on a different theme. For example, one week might highlight incorporating whole grains into the diet, including recipes and hands-on demonstrations on how to prepare a budget-friendly recipe that features whole grains. The variation in weeks can be due to the materials presented or the SNAP agent involved. Depending on the participants involved, the “Let’s Eat for the Health of It” curriculum can include lessons featuring family involvement in food preparation as well as breastfeeding; if included, these lessons are usually the reason the curriculum may span eight weeks rather than the typical six. The curriculum as a whole aims to increase participants’ knowledge of how to prepare and procure healthy foods using SNAP benefits.

Data Analysis

Along with the survey responses, demographic data including gender, race/ethnicity, and age were collected. Differences between pre- and post-test responses in intrinsic motivation and perceived competence to cook were analyzed using Student’s t-test, and effect sizes were calculated using Cohen’s d_z .¹²⁶ Pearson’s correlation coefficients were used to examine if any relationships exist between the constructs as a result of participating in the SNAP-Ed program. Statistical significance was set at $p < 0.05$. Analyses were performed using SAS[®] software (version 9.4, SAS Institute, Inc, Cary, NC, 2013).

Results

A total of 47 adults ranging from 18 to 94 years of age completed the MPHFAQ at both pre- and post-program. The participants' mean age was 39.9 ± 20.9 , and 34 (72%) were female. The racial/ethnic representation was self-reported and included 30 (64%) African Americans, 14 (30%) Caucasians, 1 (2%) Hispanic/Latino, and 2 (4%) from other/mixed race. Missing data were removed by construct for analysis; this is reflected in Table 1. Mean changes with significance and effect size in the SDT construct scores from pre- to post-SNAP-Ed participation can also be found in Table 5.

Table 5. Changes in pre- and post-program scores for outcome variables from the Motivation to Prepare Healthy Foods Questionnaire

	n	Pre	Post	Change	Effect Size
Intrinsic Motivation	46	18.7 ± 4.1	19.7 ± 4.0	0.9 ± 3.3	0.26
Perceived Competence	46	16.4 ± 4.2	18.1 ± 4.9	$1.5 \pm 3.3^{**}$	0.37
Autonomy	40	15.7 ± 3.3	17.0 ± 3.4	$1.3 \pm 3.6^{*}$	0.37
Autonomy Support	43	23.5 ± 5.4	26.2 ± 4.9	$2.7 \pm 5.4^{**}$	0.53
Relatedness	38	18.5 ± 3.3	19.2 ± 4.1	0.6 ± 3.6	0.20
Values are reported as mean \pm standard deviation *Significant change from pre to post, $p < 0.05$ **Significant change from pre to post, $p < 0.01$ Effect size was calculated using Cohen's d_z equation					

Significant increases in autonomy ($p < 0.0259$), autonomy support ($p < 0.0021$), and perceived competence to prepare healthy foods ($p = 0.0025$) were observed after participating in the program. Out of these constructs, autonomy support had the largest effect size (Table 1).

Mean pre- to post-program participation changes in SDT construct scores by self-reported gender (male vs. female) and race (categorized as white and non-white) are reported in Table 6.

Table 6. Changes in pre- and post-program scores based on gender and race for outcome variables from the Motivation to Prepare Healthy Foods Questionnaire

	Intrinsic Motivation	Perceived Competence	Autonomy	Autonomy Support	Relatedness
Gender	-2.7±3.1*	-2.2±3.2*	0.9±3.6	-1.8±5.5	-1.2±3.7
Female n=34	1.7±2.6	2.2±3.4	1.1±2.8	3.2±4.4	0.8±3.8
Male n=13	-1.0±4.1	0.0±2.3	2.0±5.4	1.4±7.9	-0.3±2.9
Race	-0.9±3.3	-1.6±3.2	-0.6±3.7	0.5±5.5	-0.3±3.7
White n=14	1.6±2.7	2.6±4.4	1.7±2.4	2.4±5.1	0.8±2.8
Non-white n=33	0.6±3.5	1.1±2.6	1.1±4.2	2.9±5.7	0.5±4.1
Values are reported as mean ± standard deviation					
*Significant change from pre to post, $p < 0.05$					

Significant differences were seen in changes in intrinsic motivation ($p = 0.0442$) and perceived competence ($p = 0.0432$) between males and females, with females reporting greater increases in these two constructs at program conclusion. No significant differences were found between races. Effect sizes for the mean construct score changes can be found in Table 7.

Table 7. Effect sizes of differences in construct scores based on gender and race

	Gender ^a	Race ^b
Intrinsic Motivation	0.86	0.29
Perceived Competence	0.68	0.49
Autonomy	0.26	0.16
Autonomy Support	0.33	0.10
Relatedness	0.32	0.08
Effect size was calculated using Cohen's d_z equation		
^a Gender based on male vs. female		
^b Race was divided into white and non-white (African American + Hispanic/Latino + Other)		

Correlations among the changes found in the SDT constructs are presented in Table 4. Change in intrinsic motivation was positively associated with changes in perceived competence ($r = 0.55$, $p < 0.0001$), autonomy support ($r = 0.49$, $p = 0.0009$), and relatedness ($r = 0.54$, $p = 0.0004$). Change in autonomy was positively associated with changes in autonomy support ($r =$

0.55, $p = 0.0002$) and relatedness ($r = 0.59$, $p = 0.0001$). Change in autonomy support was positively associated with change in relatedness ($r = 0.37$, $p = 0.0192$). While change in intrinsic motivation was not related to change in autonomy, the two shared a significant association at post-program participation ($r = 0.31$, $p = 0.0391$). Except for intrinsic motivation, there were no other significant associations observed between changes in SDT constructs and perceived competence. At post-intervention, however, perceived competence was significantly related to autonomy support ($r = 0.31$, $p = 0.041$).

Table 8. Correlations among pre- to post-program participation changes in constructs from the Motivation to Prepare Healthy Foods Questionnaire

	1	2	3	4	5
1. Intrinsic Motivation	1.00 n=46	0.55*** n=46	0.28 n=40	0.49** n=43	0.54** n=39
2. Perceived Competence		1.00 n=46	0.00 n=40	0.22 n=43	0.24 n=39
3. Autonomy			1.00 n=40	0.55** n=40	0.59*** n=37
4. Autonomy Support				1.00 n=43	0.37* n=39
5. Relatedness					1.00 n=39
Changes in constructs were calculated by subtracting the pre-score from the post-score. * $p < 0.05$, ** $p < 0.001$, *** $p < 0.0001$					

Discussion

This study provides evidence that the MPHFAQ is able to measure change in intrinsic motivation and perceived competence to prepare healthy foods as a result of participating in the “Let’s Eat for the Health of It” curriculum provided by SNAP-Ed. The SDT suggests that when relatedness, autonomy support, and perceived competence are fostered, intrinsic motivation will increase in an individual.²⁰ This hypothesis is consistent with the findings of the current study. Although change in autonomy was not significantly related to change in intrinsic motivation, it was significantly associated with intrinsic motivation in the post-program assessment. Perceived competence shared the strongest association with intrinsic motivation, which is also supported by

the SDT. Interestingly, relatedness appeared to have the greatest relationship with autonomy rather than autonomy support. This might suggest peers have a stronger impact than someone in an instructive position on an individual's feelings of autonomy. This finding, however, could also be related to the age of the participants. Autonomy support has been reported to have a positive influence on college-aged students, but this might not be generalizable to older adults outside of a traditional classroom setting.¹²⁷ While the findings of the present study are congruent with results from other studies, additional analyses are needed to further explore and better understand these interrelationships.

Many barriers exist to preparing food at home including time, availability of adequate resources, and proper knowledge of necessary cooking skills.^{3-8,32} Although perceived competence to prepare healthy foods increased from baseline as a result of participating in SNAP-Ed, it is unclear if the participants were able to translate these perceived abilities into practice in their homes. Similarly, it is uncertain if the increase in female participants' intrinsic motivation increased these participants' likelihood of preparing healthy foods. These are questions that should be investigated in future research to elucidate the possible impact SNAP-Ed has outside of its program.

The use of a validated, internally consistent, reliable, and theoretically-based questionnaire is the major strength of this study; use of such evaluation methods are critical for the assessment of these programs.¹⁴ However, this may be unrealistic to employ in SNAP-Ed as states, including Louisiana, have flexibility in how programs are delivered.¹²⁸ While the majority of Louisiana SNAP-Ed agents who delivered the "Let's Eat for the Health of It" program used standard Food and Nutrition Services (FNS) materials as the basis of the lessons required for the educational component, individual educators may have developed their own lessons and utilized

various (i.e. inconsistent) resources.¹²⁹ Lessons may also have spanned a varying number of weeks depending on the agent presenting the material. This presents a limitation to this study assessing program effectiveness as it is unclear which participants may have received additional material to the standard curriculum or who may have received lessons in a condensed form. As this was a secondary analysis, it is unclear which participants may have received hands-on cooking demonstrations or additional weeks of instruction as part of their curriculum. The data are self-reported, which also poses a limitation to this study. Additionally, no control group was established with which to compare these results.

This study suggests that the MPHFAQ has the ability to detect changes in the SDT constructs as they pertain to preparing healthy foods. Likewise, this study provides further evidence that the MPHFAQ is a reliable and consistent evaluation tool capable of assessing the impact of participating in nutrition education programs on SNAP-Ed participants' intrinsic motivation and perceived competence to prepare healthy foods. The results of this study also indicate that the five SDT constructs share associations that align with the interrelationships proposed by Deci and Ryan.^{19,20} Few studies have evaluated the SDT in the context of nutrition education and cooking demonstrations; however, this study supports its potential use in these settings. While the SNAP-Ed programs examined in the present study were not constructed to follow, nor were they based upon, the SDT framework, the inherent structure of the program and the results of this study indicate that this theory could be of relevance to the SNAP-Ed setting. Additional studies are needed to provide a better understanding of the relationships reflected in these findings and how they might apply in the SNAP-Ed participants' personal lives.

CHAPTER FIVE

SUMMARY AND CONCLUSIONS

The validity studies conducted using college students' responses to the MPHFAQ have provided evidence of its construct validity, internal consistency, and reliability. The EFA returned five latent constructs that were consistent with the psychological constructs defined by the SDT; all of the items assigned to the constructs remained in their respective factors. Each factor displayed acceptable internal consistency based on Cronbach's alpha coefficients. Test-retest analysis demonstrated the questionnaire ability to remain stable over a two-week time period. The factors returned by the EFA were then confirmed in the CFA, which provided support of adequate model fit for the hypothesized model. A respecification analysis was subsequently conducted on a hold-out sample; these findings were consistent with the CFA, providing additional support for adequate model fit. Model fit was determined by assessing various fit criteria. Two of the measures, RMSEA and SRMR, were acceptable values;¹¹⁵ the remaining two measures, CFI and NNI, were slightly below the recommended 0.95 cutoff value, but were deemed acceptable due to their close proximity. These studies were further strengthened by their large sample sizes.

As hypothesized, those who participated in the SNAP-Ed "Let's Eat for the Health of It" curriculum, which provides adults eligible for SNAP benefits a series of nutrition education lessons, reported increases in perceived competence to prepare healthy foods upon completion of their programs. While there was not a significant increase in intrinsic motivation in all of the adults sampled, females reported a significant increase in their intrinsic motivation to prepare healthy foods at the conclusion of their SNAP-Ed experience. These results suggest that SNAP-Ed could have a positive impact on participants' perceived abilities to prepare healthy foods; they may also suggest that female participants were more receptive to the program's lessons

thereby increasing their perceived competence and intrinsic motivation to prepare healthy foods. This could be because females are typically responsible for food purchases and preparation in their homes, but this needs to be further explored in the context of SNAP-Ed and home food preparation behaviors. Additionally, these findings need to be evaluated in future studies to determine whether they have any relationship to a participant's ability to prepare healthy foods at home/outside of SNAP-Ed. Significant relationships were found among the five psychosocial constructs, which was consistent with the SDT.^{19,20} Change in intrinsic motivation was significantly associated with changes in perceived competence, autonomy support, and relatedness. Intrinsic motivation assessed at the completion of the program was significantly related to autonomy. As expected, autonomy was strongly correlated with autonomy support. Autonomy was more strongly associated with relatedness, however. This might suggest that older adults may experience greater autonomous functioning when they feel closer to their peers rather than to a formal instructor. This relationship should be investigated in future studies to determine if SNAP-Ed participants perceive peer relationships to be more influential than their relationship with their teacher when preparing healthy foods.

While the results of these studies are encouraging, additional research is needed. First, the MPHFAQ needs to undergo further validity testing via discriminant and convergent validity. To establish discriminant validity, the MPHFAQ statements need to be matched to different instrument statements to ensure responses do not overlap and are not related to another scale. For convergent validity, the MPHFAQ statements must be matched to similar scales; in this testing, it is expected that the response scores will be similar thereby establishing its convergence. As previously discussed in this chapter, the findings from the SNAP-Ed secondary analysis warrant further exploration. The significant increase observed in perceived competence as a result of

participating in the SNAP-Ed “Let’s Eat for the Health of It” curriculum is noteworthy and suggests participation in SNAP-Ed is valuable to those eligible to receive SNAP benefits. These results also provide evidence that the MPHFAQ can be used in nutrition education settings to assess program effectiveness.

The MPHFAQ has demonstrated its potential for use as a reliable evaluation tool for nutrition education programs such as SNAP-Ed. Although SNAP-Ed does not utilize one overarching behavior theory to guide program lessons, it could still benefit from testing program effectiveness using a theoretically-based and validated instrument. Utilization of the MPHFAQ in future SNAP-Ed programs would offer greater consistency in outcome measures, potentially allowing for stronger conclusions to be drawn regarding the impact of participating in SNAP-Ed.

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APPENDIX A

INSTITUTIONAL REVIEW BOARD APPROVAL AND REVIEW



LSU AgCenter Institutional Review Board (IRB)
 Dr. Michael J. Keenan, Chair
 School of Human Ecology
 209 Knapp Hall
 225-578-1708
 mkeenana@agctr.lsu.edu

Application for Exemption from Institutional Oversight

All research projects using living humans as subjects, or samples or data obtained from humans must be approved or exempted in advance by the LSU AgCenter IRB. This form helps the principal investigator determine if a project may be exempted, and is used to request an exemption.

- Applicant, please fill out the application in its entirety and include the completed application as well as parts A-E, listed below, when submitting to the LSU AgCenter IRB. Once the application is completed, please submit the original and one copy to the chair, Dr. Michael J. Keenan, in 209 Knapp Hall.
- A Complete Application Includes All of the Following:
 - (A) The original and a copy of this completed form and a copy of parts B through E.
 - (B) A brief project description (adequate to evaluate risks to subjects and to explain your responses to Parts 1 & 2)
 - (C) Copies of all instruments and all recruitment material to be used.
 - If this proposal is part of a grant proposal, include a copy of the proposal.
 - (D) The consent form you will use in the study (see part 3 for more information)
 - (E) Beginning January 1, 2009: Certificate of Completion of Human Subjects Protection Training for all personnel involved in the project, including students who are involved with testing and handling data, unless already on file with the LSU AgCenter IRB.
 Training link: http://nrcs.nih.gov/rants/ohcv/h_trainin.htm

1) Principal Investigator: Georgianna Tuuri Rank: Associate Professor Student? Y/N
 Dept: Nutrition and Food Sciences Ph: 8-1722 E-mail: gtuuri@agcenter.lsu.edu

2) Co-Investigator(s): please include department, rank, phone and e-mail for each

- If student as principal or co-investigator(s), please identify and name supervising professor in this space

Ariana Bailey School of Nutrition and Food Sciences Graduate Student, 8-1722. adelon3@lsu.edu

3) Project Title: Validation of a Survey to Assess Young Adults' Motivation to Prepare and Consume Healthy Foods

4) Grant Proposal?(yes or no) No If Yes, Proposal Number and funding Agency _____

Also, if Yes, either: this application completely matches the scope of work in the grant Y/N
 OR

more IRB applications will be filed later Y/N _____

5) Subject pool (e.g. Nutrition Students) Louisiana State University students 18-30 years of age

- Circle any "vulnerable populations" to be used: (children<18, the mentally impaired, pregnant women, the aged, other). Projects with incarcerated persons cannot be exempted

6) PI signature Georgianna Tuuri **Date 7/13/15 (no per signatures)

**I certify that my responses are accurate and complete. If the project scope or design is later changed I will resubmit for review. I will obtain written approval from the Authorized Representative of all non-LSU AgCenter institutions in which the study is conducted. I also understand that it is my responsibility to maintain copies of all consent forms at the LSU AgCenter for three years after completion of the study. If I leave the LSU AgCenter before that time the consent forms should be preserved in the Departmental Office.

Committee Action: Exempted ☒ Not Exempted _____ IRB# HE15-12

Reviewer Michael Keenan Signature Michael Keenan Date 8-11-2015

Part 1: Determination of “Research” and Potential for Risk

- This section determines whether the project meets the Department of Health and Human Services (HHS) definition of research involving human subjects, and if not, whether it nevertheless presents more than “minimal risk” to human subjects that makes IRB review prudent and necessary.

1. Is the project involving human subjects a systematic investigation, including research, development, testing, or evaluation, designed to develop and contribute to generalizable knowledge?

(Note some instructional development and service programs will include a “research” component that may fall within HHS’ definition of human subject research)

☒ **Yes**

☐ **No**

2. Does the project present physical, psychological, social or legal risks to the participants reasonably expected to exceed those risks normally experienced in daily life or in routine physical or psychological examination or testing?

You must consider the consequences if individual data inadvertently become public.

☐ **Yes Stop.** This research cannot be exempted—submit application for full IRB review.

☒ **No Continue** to see if research can be exempted from IRB oversight.

3. Are any of your subjects incarcerated?

☐ **Yes Stop.** This research cannot be exempted—submit application for full IRB review.

☒ **No Continue** to see if research can be exempted from IRB oversight.

4. Are you obtaining any health information from a health care provider that contains any of the identifiers listed below?

A. Names

B. Address: street address, city, county, precinct, ZIP code, and their equivalent geocodes. Exception for ZIP codes: the initial three digits of the ZIP code may be used, if according to current publicly available data from the Bureau of the Census: (1) The geographic unit formed by combining all ZIP codes with the same three initial digits contains more than 20,000 people; and (2) the initial three digits of a ZIP code for all such geographic units containing 20,000 or fewer people is changed to ‘000.’ (Note: The 17 currently restricted 3-digit ZIP codes to be replaced with ‘000’ include: 036, 059, 063, 102, 203, 556, 692, 790, 821, 823, 830, 831, 878, 879, 884, 890, and 893.)

- C. Dates related to individuals
 - a. Birth date
 - b. Admission date
 - c. Discharge date
 - d. Date of death
 - e. And all ages over 89 and all elements of dates (including year) indicative of such age. Such ages and elements may be aggregated into a single category of age 90 or older
- D. Telephone numbers;
- E. Fax numbers;
- F. Electronic mail addresses;
- G. Social security numbers;
- H. Medical record numbers (including prescription numbers and clinical trial numbers);
- I. Health plan beneficiary numbers;
- J. Account numbers;
- K. Certificate/license numbers;
- L. Vehicle identifiers and serial numbers including license plate numbers;
- M. Device identifiers and serial numbers;
- N. Web Universal Resource Locators (URLs);
- O. Internet Protocol (IP) address numbers;
- P. Biometric identifiers, including finger and voice prints;
- Q. Full face photographic images and any comparable images;
- R. Any other unique identifying number, characteristic, or code; except a code used for re-identification purposes and;
- S. The facility does not have actual knowledge that the information could be used alone or in combination with other information to identify an individual who is the subject of the information

☐ **Yes Stop.** This research cannot be exempted—**submit application for full IRB review.**

☒ **No Continue** to see if research can be exempted from IRB oversight.

**Part 2: Exemption Criteria for Research Projects Can
be found on the Next Page.**

Part 2: Exemption Criteria for Research Projects

Please select any and all categories that relate to your research. Research is exemptible when all research methods are one or more of the following five categories. Check statements that apply to your study:

☐ 1. In education setting, research to evaluate normal educational practices.

☐ 2. For research not involving vulnerable people [prisoner, fetus, pregnancy, children, or mentally impaired]: that observes public behavior (including participatory observation), or with interviews or surveys or educational tests:

The research must also comply with ONE of the following:

☐ a) The participants cannot be identified, directly or statistically;

or that

☒ b) The responses/observations could not harm participants if made public;

or that

☐ c) Federal statute(s) completely protect all participants' confidentiality.

☐ 3. For research not involving vulnerable people [prisoner, fetus, pregnancy, children, or mentally impaired]: that observes public behavior (including participatory observation), or with interviews or surveys or educational tests:

☐ All respondents are elected, appointed, or candidates for public offices.

☐ 4. Uses only existing data , documents, records, or specimens properly obtained.

The research must also comply with ONE of the following:

☐ a) Subjects cannot be identified in the research data directly or statistically, and no one can trace back from research data to identify a subject;

or that

☐ b) The sources are publicly available

_____ 5. Research or demonstration service/care programs, e.g. health care delivery.

The research must also comply with ALL of the following:

_____ a) It is directly conducted or approved by the head of a US Government department or agency;

and that

_____ b) It concerns only issues under usual administrative control (48 Fed Reg 9268-9), e.g. regulations, eligibility, services, or delivery systems;

and that

_____ c) Its research/evaluation methods are also exempt form IRB review.

_____ 6. For research not involving vulnerable people [prisoner, fetus, pregnancy, or mentally impaired; Note that children can participate for an exempt study]: with food to evaluate quality, taste, or consumer acceptance.

The research must also comply with ONE of the following:

_____ a) The food has no additives;

or that

_____ b) The food is certified safe by the USDA, FDA or EPA.

**Part 3: Consent Form Information
Can be Found on the Next Page.**

Part 3: Information on Consent Forms

- The consent form must be written in non-technical language which can be understood by the subjects. It should be free of any exculpatory language through which the subject is made to waive, or appears to be made to waive any legal rights, including any release of the investigator(s), sponsor, institution or its agents from liability for negligence. (Note: the consent form is not a contract)
- For example consent forms, please refer to the LSU campus IRB website, <http://www.lsu.edu/irb/researchers.shtml>
- The LSU AgCenter IRB prefers using signed informed consent. However, if that is impractical, an application to waive signed consent can be requested below. When this waiver is requested, the **LSU AgCenter IRB must be provided with the consent script** that will present the information about consent to human subjects regarding the study/research. All consent forms or scripts must include a statement that the study was approved by the LSU AgCenter IRB and provide LSU AgCenter IRB contact information to participants: Dr. David Morrison at 225-578-4182. **Note: Parental consent usually cannot be waived for studies with children as subjects.**

I am requesting waiver of **SIGNED** Informed Consent because:

___ (a) Having a participant sign the consent form would create the **principal risk** of participating in the study

or that

___ (b) The research presents **no more than minimal risk** of harm to subjects and involves no procedures for which having signed consent is normally required outside of the research environment.

Now that your application is complete, please send two copies of it to the LSU AgCenter IRB for review, at the address listed below.



LSU AgCenter Institutional Review Board
Dr. Michael J. Keenan, Chair
209 Knapp Hall
Baton Rouge, LA 70803
Ph: 225-578-1708
Fax: 225-578-4443
E-mail: mkeenan@agctr.lsu.edu

“Validation of a Questionnaire to Assess Young Adults’ Motivation to Prepare and Consume Healthy Foods”

Description:

The purpose of this study is to validate an instrument that assesses young adults’ motivation to prepare and consume healthy foods. The instrument is a questionnaire composed of four components: intrinsic motivation, perceived competence, autonomy, autonomy support and relatedness. The questionnaire will also include a food preference survey regarding willingness to consume whole grain foods and will allow researchers to estimate intentions to eat these items.

The subjects will be college students between 18 and 30 years of age. Students will provide written consent. The questionnaire will ask students their attitudes toward their teachers and peers. Confidentiality of the student responses will be maintained by the researchers; student responses will remain anonymous and will not be shared with their teachers. Researchers will collect the required consent forms and data for analysis. Statistical analysis will be performed to determine the validity of the instrument. After the instrument has been validated, it will be used to examine young adults’ intrinsic motivation and perceived competence to prepare healthy foods, autonomy, autonomy support, and relatedness and willingness to eat whole grain foods.

Timeline and Locations for Collecting Data

The classes of interest are within Louisiana State University. The questionnaires will be administered to students during the 2015 fall semester after receiving the teachers' approvals and at the teachers' convenience. The students will be able to complete the questionnaires after the appropriate consent forms are completed. Researchers will administer the questionnaires to a variety of classes at various times. The approximate time for completing the questionnaire is ten to fifteen minutes.

DATE: 4/5/2017

TO: Dr. Keenan

FROM: Ariana Bailey

RE: Small modification in IRB Protocol for HE15-12

The adult consent form and locations for data collections of the Motivation to Prepare and Consume Healthy Foods questionnaire now includes the following changes:

- The age range for data collection is now 18-100 years of age
- Participants will include those involved in SNAP-Ed programs and senior feeding sites, which are located outside of Louisiana State University.

APPENDIX B
ADULT CONSENT TO TAKE A QUESTIONNAIRE

CONSENT TO TAKE A QUESTIONNAIRE

Adult Consent Form

Dear potential participant,

We would like to better understand adults' motivation to prepare healthy foods. If you agree to help us, we will ask you to complete a questionnaire by filling in the appropriate circles for your responses. The questionnaire will take five to ten minutes to complete and will be administered. This will be provided at no cost to the participant and participation is voluntary.

If you have any questions you can contact either one of the following investigators:

Georgianna Tuuri, PhD, LDN, RD
Associate Professor of Nutrition
School of Nutrition and Food Sciences
Phone: 225-578-1722

Ariana Bailey, MS
Graduate Student
School of Nutrition
and Food Sciences

Caroline Winer
Undergraduate Researcher
School of Nutrition and
Food Sciences

The questionnaire has been explained to me and all of my questions have been answered. I may direct additional questions regarding program specifics to the investigators. If I have questions about subjects' rights or other concerns, I can contact Dr. Phil H. Elzer, Associate Vice Chancellor & Associate Director, LSU AgCenter, (225) 578-4182. I will consent to described on the back of this page and acknowledge the investigators' obligation to provide me with a signed copy of this consent form.

Your Signature: _____ Date: _____

Information about you:

Name: _____ (please print)

Sex: _____

Age: _____

Race/Ethnicity: _____

Please provide us with your email address in case we need to contact you:

Email: _____

Description of the Study

Project Title: “Validation of a Survey to Assess Adults’ Motivation to Prepare Healthy Foods”

Investigators: The following investigators are available for questions, M-F 8:00 am-4:30 p.m.

Georgianna Tuuri, PhD, LDN, RD
Associate Professor of Nutrition
School of Nutrition and Food Sciences
Phone: 225-578-1722

Ariana D. Bailey, MS
Graduate Student
School of Nutrition
and Food Sciences

Caroline Winer
Undergraduate Researcher
School of Nutrition
and Food Sciences

Purpose of the Program: To assess adults’ motivation to prepare and consume healthy foods.

Inclusion Criteria: Adults 18 to 100 years of age.

Exclusion Criteria: Adults older than 100 years of age and women who are pregnant.

Description of the Program: Before participating, adults 18 to 100 years of age will complete a consent form. After the appropriate, required form is completed, the adults who are 18 to 100 years of age will complete the questionnaire. The questionnaire will take approximately five to ten minutes to complete.

Benefit: You will help researchers learn more about motivation to prepare healthy foods.

Risks: There are no known risks involved.

Right to Refuse: Participation is voluntary. You may withdraw yourself from the program at any time.

Privacy: Results of the scores may be published, but no names or identifying information will be included for publication. A person’s identity will remain confidential unless disclosure is required by law.

Financial Information: There is no cost to participate in this study.

APPENDIX C

MOTIVATION TO PREPARE HEALTHY FOODS QUESTIONNAIRE

Motivation to Prepare and Consume Healthy Food

Fruits, vegetables, low-fat milk and milk products, and whole grains are considered healthy foods while foods high in sodium (salt), solid fats, and added sugars are considered less healthy.

Instructions: The following sentences refer to your overall experiences preparing healthy food. Using the 5-point scale below, please indicate the extent to which you agree with statements by completely filling in your response.

	<i>Disagree a lot</i>	<i>Disagree</i>	<i>Neither Agree/ Disagree</i>	<i>Agree</i>	<i>Agree a lot</i>
1. I enjoy preparing healthy food.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. I think it is satisfying to prepare healthy food.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Preparing healthy food holds my attention well.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. I feel engaged when I am preparing healthy foods.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. I understand the value of preparing healthy food.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. I believe I am talented at preparing healthy food.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. I do pretty well preparing healthy food compared to other people my age.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. I feel pretty confident about my food preparation skills.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. I am satisfied with my ability to prepare healthy foods.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. I am pretty skilled at preparing healthy food.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Instructions: Please indicate how much you agree or disagree with the following statements about your overall experiences with the instructor in this class:

	<i>Disagree a lot</i>	<i>Disagree</i>	<i>Neither Agree/ Disagree</i>	<i>Agree</i>	<i>Agree a lot</i>
11. My instructor provides me with choices and options.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. I feel my instructor understands me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. My instructor expresses confidence in my ability to do well in the course.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14. My instructor encourages me to ask questions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15. My instructor listens to how I would like to do things.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16. My instructor considers how I see things before suggesting a new way to do things.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Instructions: Please indicate how much you agree or disagree with the following statements about your overall experiences with your fellow classmates in this class:

	<i>Disagree a lot</i>	<i>Disagree</i>	<i>Neither Agree/ Disagree</i>	<i>Agree</i>	<i>Agree a lot</i>
17. I can trust my classmates.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18. I would like a chance to interact with my classmates more often.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19. It is likely that my classmates and I could become friends if we interacted a lot.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20. I feel close to my classmates.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
21. I enjoy interacting with my classmates.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Instructions: Please indicate how much you agree with the following statements about your overall actions in this class:

	<i>Disagree a lot</i>	<i>Disagree</i>	<i>Neither Agree/ Disagree</i>	<i>Agree</i>	<i>Agree a lot</i>
22. If I had the choice, I would choose to take this class.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
23. I feel comfortable participating in class.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
24. I feel free to make my own decisions in class.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
25. I feel free to express myself, my opinions, and my concerns in class.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please check one of the following statements:

- ☐ I am currently taking a cooking class.
- ☐ I have taken a cooking class before.
- ☐ I have never taken a cooking class.

VITA

Ariana DeLong Bailey was born in West Virginia before moving to Kentucky to attend high school and college. In 2014, she graduated summa cum laude from Western Kentucky University in Bowling Green, Kentucky with a Bachelor of Science in Hospitality Management and Dietetics. She then entered Louisiana State University where she received her Master of Science degree in Human Nutrition in 2016. Ariana then continued her studies at LSU where she is expected to graduate with her Ph.D. in Nutrition and Food Sciences with a concentration in Human Nutrition and a minor in Applied Statistics in December 2018. She is a member of the American Society for Nutrition.